This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

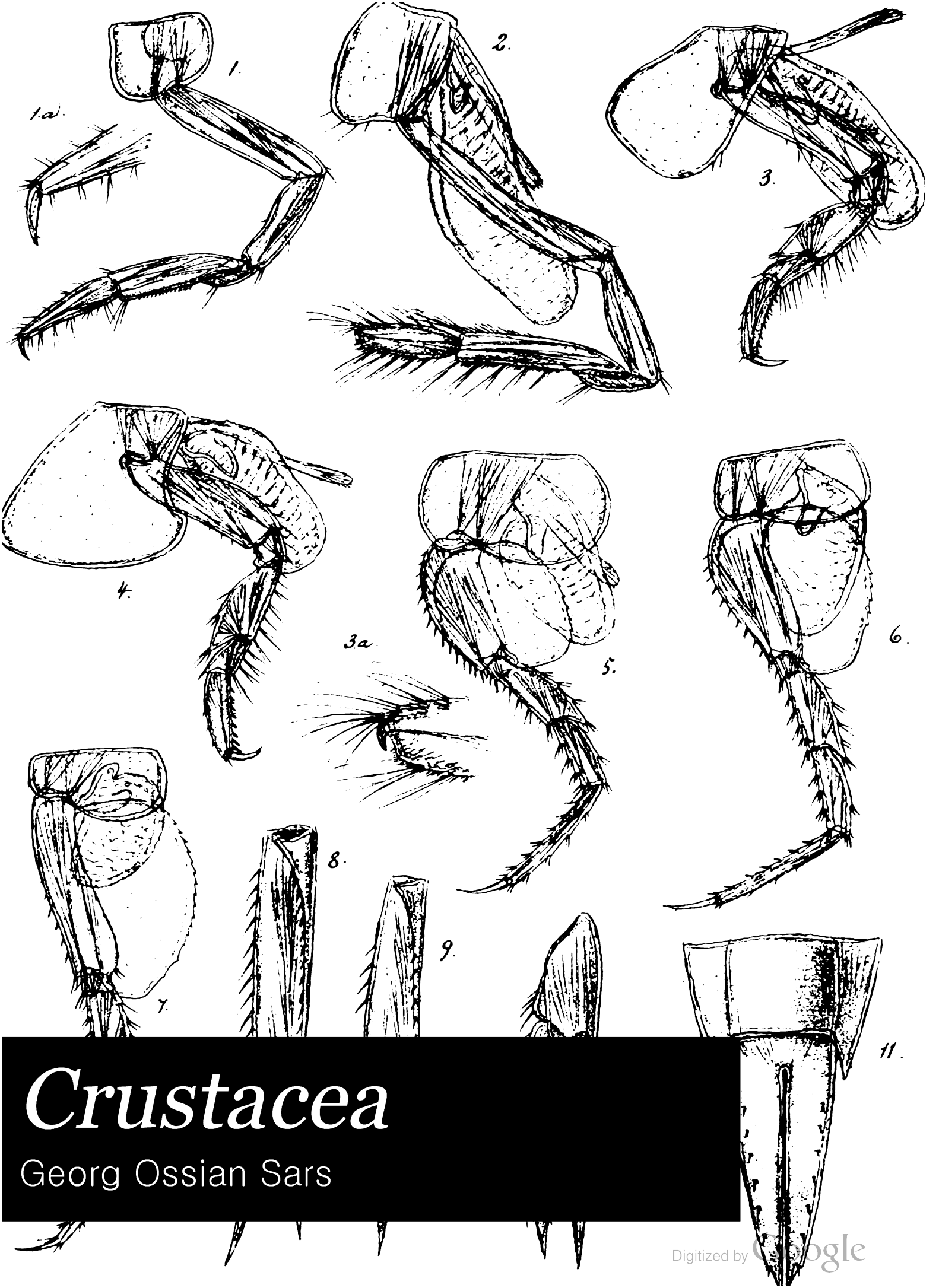
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



Crustacea

Georg Ossian Sars

Digitized by Google

Cr-S

Cr.S

A. AGASSIZ.

HARVARD UNIVERSITY.

LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY.

14,461

GIFT OF

ALEX. AGASSIZ.

April 16. 1900

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

THE NORWEGIAN

NORTH

POLAR EXPEDITION

1893—1896

SCIENTIFIC RESULTS

EDITED BY

FRIDTJOF NANSEN

V. CRUSTACEA

BY

G. O. SARS

PUBLISHED BY THE FRIDTJOF NANSEN FUND
FOR THE ADVANCEMENT OF SCIENCE

CHRISTIANIA
JACOB DYBWAD

LONDON,
NEW YORK, BOMBAY
LONGMANS, GREEN, AND CO.

LEIPZIG
F. A. BROCKHAUS

T 1900

Digitized by Google

Digitized by Google

V.

CRUSTACEA

BY

G. O. SARS.

Digitized by Google

Digitized by Google

INTRODUCTION.

Of the zoological collections brought home from the Norwegian North Polar Expedition, those relating to the marine invertebrate animals have been placed in my hands for examination and description, and I now propose to report on the results of my investigations as far as the *Crustacea* are concerned. Indeed, by far the greater number of the animals collected belongs to this extensive class, and there is comparatively little to report of other animals. As, however, all knowledge of the fauna in this far remote, and hitherto unexplored part of the North Polar Sea may be of considerable interest, it is my intention in a subsequent paper also to give a short account of the other marine invertebrates found during the Expedition.

The collection in question consists of several tubes and bottles from different localities, each, as a rule, labelled with date, depth and mode of preservation. I have carefully gone through the contents of all the samples, in order to gain both a general view of the character of the fauna, and more special information about the several species. Only one of the bottles contained true bottom-animals taken up by the aid of the trawl; all the other samples have been procured by the aid of the tow-net, and of course contain exclusively pelagic animals, chiefly *Crustacea*. Of these again *Copepoda*, chiefly belonging to the *Calanoid* group, are predominant, having been taken in nearly every haul and in considerable numbers along the whole route of the "Fram". This peculiar character of the collections is due to the unexpected physical conditions found in the Polar Sea traversed. As is well known, it has until recently been the general assumption of geographers, that the Polar basin, north of Siberia and Franz Josef Land,

Digitized by Google

could only be quite a shallow sea, with depths scarcely exceeding some hundred fathoms, and the zoological equipment of the 'Fram' Expedition was arranged in accordance therewith. But in direct contradiction to this generally adopted view, that part of the Polar Sea through which the 'Fram' drifted with the ice, proved to be everywhere of enormous depth, exceeding in this respect even the Norwegian Sea. The quantity of hemp-rope at hand was quite insufficient for dredging or trawling in such depths, and, indeed, it was a matter of no little trouble to find a means of ascertaining the depth with exactness. For this purpose it was necessary to make up from the wire-ropes of the 'Fram' a provisional sounding-line of sufficient length and consisting of thin steel-wire. To the end of this line, which of course was far from being strong enough for dredging operations, was appended in some instances a heavy water-bottle, in others an ordinary lead, and in the latter case a sample of the bottom was always brought up together with the lead. But on a preliminary examination, scarcely any traces of organisms could ever be detected in this material, and it must be concluded from this that there is at least very little animal life on the bottom in this part of the ocean. On the other hand, it is a very remarkable fact, that the more superficial strata of the sea, though almost perpetually covered with a layer of ice, through which comparatively small, temporary openings occur in the shape of channels and lanes, were found to abound with life at all times of the year, and even to the most northerly latitudes reached. It is very probable, too, that the pelagic animals observed are not strictly confined to the more superficial strata of the sea, but that they also at times descend to considerable depths, perhaps even to the strata immediately covering the bottom. In many cases the tow-net was lowered to depths exceeding 200 or 300 metres, and, as a rule, the draught was considerably richer in such instances, than when it was working in smaller depths. Moreover, the peculiar Amphipode described below as *Cyclocaris Guilelmi* Chevreux, was found several times clinging to the sounding-line at only a short distance above the water-bottle, which was hauled up from depths between 500 and 1000 metres. The imperfect development of the visual organs in this form, and likewise in some of the other pelagic animals observed, would also seem to point to abyssal habits.

Digitized by Google

As to the general character of the pelagic fauna in the North Polar Basin explored by the Expedition, it exhibits, on the whole, a pronounced resemblance to that of the North Atlantic Basin, the greater number of species having, indeed, proved to be common to both. In considering the *Calanoida* in particular, it was not a little surprising to find rather abundantly represented in the samples, some characteristic forms well known to me from the deep fjord-basins of the south and west coasts of Norway, but hardly ever recorded by any foreign zoologists, though they must doubtless also occur in the North Atlantic Basin. These forms, which have occasionally been mentioned by me as deep-water Calanoida, are, indeed, at least off our coasts, only met with in depths of more than 100 fathoms, whereas in the North Polar Basin they often ascend to the very surface of the sea. Intermingled with them were some well-known surface-Calanoids, such as the widely distributed *Calanus finmarchicus, Pseudocalanus elongatus,* etc. There are, moreover, a number of hitherto unknown forms, to be presently described in detail, which accordingly might be regarded as peculiar to the Polar basin; but it is not improbable that on a closer investigation, these forms will also be found to occur in the northern part of the Atlantic basin. Indeed, strictly speaking, the most westerly part of the 'Fram's' route lies on the border between the two basins; and yet the character of the fauna here did not differ in any essential manner from that in the eastern part. As, however, the superficial current in the North Polar Sea has been clearly shown to flow in a westerly direction, it is possible to suppose that some forms at least might have their centre of distribution far east, perhaps even in the Bering Sea. But as the pelagic fauna of that part of the ocean is still very imperfectly known, it is as yet impossible to decide with certainty which forms in such cases ought to be regarded as immigrants from the east. At any rate, though the existence of the western current has been demonstrated in a most convincing manner by the drift of the 'Fram', there is also full evidence of the existence of a current in quite the opposite direction, but confined to the deeper strata of the sea; for both the comparatively high temperature of the water found down to the lowest depths and its great salinity clearly show it to be derived from the Atlantic Basin. An immigration of animals to the North Polar Sea may accordingly be possible from both the west and the east; but, as the more superficial strata flowing in a westerly direction, together with the ice covering

Digitized by Google

them, are largely mingled with fresh water, and constantly subjected to a rather low temperature, they seem in reality to offer less favourable conditions for the well-being of higher organisms. I am therefore of opinion, that the bulk of the pelagic animals found in the North Polar Basin are in fact derived from the west through the Atlantic current flowing in beneath the superficial Siberian current. On the other hand, I think that the latter is of great importance in conveying a constant supply of nourishment to the pelagic animals of the North Polar Basin. This nourishment consists of microscopic algæ, chiefly *Diatomeæ*, which are found to abound in the superficial polar water of the Siberian Sea, though gradually diminishing in quantity westwards, apparently owing to their being largely fed upon by the various pelagic animals. Indeed, without such a constant conveyance of nourishing matter, there could be no such rich animal life in the Polar Sea.

It is a very remarkable fact, that forms which have hitherto been regarded as quite southern in distribution, are also represented in the Polar Sea. I have several instances of this remarkable occurrence to report on, as regards the pelagic Copepoda. Thus, in a sample taken at about the centre of the Polar basin traversed, I found a well preserved specimen of a Calanoid, differing conspicuously in its external appearance from all the other forms, and easily recognizable as a species of the genus *Hemicalanus* Claus. This genus has as yet only been known from the Mediterranean and the tropical parts of the Atlantic and Pacific Oceans, never having been met with either off the Norwegian coast or off the Atlantic coast of Europe. Furthermore, in the sea north of the New Siberian Islands, two species of the genus *Oncæa* Phillipi are found in great abundance, and both these species I have been enabled to identify with perfect certainty with species recently recorded by Dr. Giesbrecht from the Bay of Naples. One of the species, *O. conifera* Giesbr., was certainly observed by the present author many years ago off the south coast of Norway; but the other species, *O. notopoda* Giesbr., is as yet only known from the Mediterranean. In about the same tracts, in which the two above-mentioned species of *Oncæa* occurred, another very peculiar Copepod, belonging to the same group, was met with. It is a species of the genus *Lubbockia* Claus, hitherto only known from the Mediterranean and the tropical parts of the oceans. Finally, in the very same sample in which the last-named Copepod was found, I succeeded in picking up some specimens of

Digitized by Google

a small, perfectly hyaline Copepod of a still more peculiar appearance, and at once recognizable as a species of the highly remarkable genus *Mormonilla* of Giesbrecht, the systematic position of which is still rather doubtful. Only two species of this genus have hitherto been recorded, and both of them were found in the tropical part of the Pacific, south of the equator. The polar form so closely resembles one of the two species described by Dr. Giesbrecht, that I should have been much inclined to identify the two forms, were it not that the great distance between the occurrences seems to forbid such an identification. The very close, and apparently genetic relationship between the two polar species of the amphipodous genus *Pseudalibrotus* to be described below, and those occurring in the Caspian Sea, is another remarkable instance, which seems fully to corroborate the correctness of the assumption of geologists as to a direct connexion in olden times between this isolated basin and the North Polar Sea.

In order to show the general character of the pelagic fauna in the Polar Sea, I subjoin lists of the species found in 5 widely-separated tracts of the region traversed by the "Fram".

No. 1.

12th to 24th October, 1893.

Sea north of New Siberia (beginning of the drift).

In about 78° N. Lat., 136° E. Long.

Sabinea septemcarinata (Sab.). Myto-stage.

Parathemisto oblivia Krøyer.
Metopa longicornis Boeck.
Gammarus locusta, var. *mutata*, Lilljeb.

Calanus finmarchicus, Gun.
— *hyperboreus*, Krøyer.
Pseudocalanus elongatus, Boeck.
— *major*, G. O. Sars.
— *pygmæus*, G. O. Sars.
Euchæta norvegica, Boeck.

Digitized by Google

Metridia longa, (Lubb.).
Acartia longiremis, Lilljeb.
Oithona similis, Claus.
Oncæa conifera, Giesbr.
— *notopoda*, Giesbr.
Conchœcia maxima, Brady & Norm.
Cirripedia-larva in Cypris-stage.
Clione papilionacea Pall. *(larva)*.
Appendicularia.
Sagitta (Spadella).
Young of Ophiura?
Medusoid.
Number of *Diatomeæ (Chætoceras)*.

No. 2.

March—April, 1894.

In about 80° N. Lat., 134° E. Long.

Hymenodora glacialis, (Buchh.)
Thysanoëssa longicaudata, Kr.

Euthemisto libellula (Mandt).
Parathemisto oblivia, (Krøyer).
Lanceola Clausi, Bovallius.
Scina borealis, G. O. Sars.
Cyclocaris Guilelmi, Chevreux.
Pseudalibrotus glacialis, G. O. Sars.
— *Nanseni*, G. O. Sars.
Eusirus cuspidatus, Krøyer.
Amphithopsis glacialis, Hansen.
Gammarus locusta Lin., var. *mutata*.
Amathilla pingvis (Krøyer).

Dajus mysidis Krøyer, (larvæ in 1st and last stages).
Cryptoniscid-larvæ.

Digitized by Google

Calanus finmarchicus, Gunn.
— *hyperboreus*, Krøyer.
Scaphocalanus acrocephalus, G. O. Sars.
Undinella oblonga, G. O. Sars.
Euchæta norvegica, Boeck.
Chiridius armatus, (Boeck).
— *tenuispinus*, G. O. Sars.
Pseudocalanus major, G. O. Sars.
Spinocalanus longicornis, G. O. Sars.
Drepanopus Bungei, G. O. Sars.
Heterochæta norvegica, Boeck.
— *compacta*, G. O. Sars.
Augaptilus glacialis, G. O. Sars.
Metridia longa, (Lubbock).
Temorites brevis, G. O. Sars.

Conchoecia maxima, Brady & Norm.
Sagitta (Spadella).
Only slight traces of algæ.

No. 3.

April—August, 1895.

Between 84° 15′ and 84° 42′ N. Lat., and between 96° and 72° E. Long.

Thysanoëssa longicaudata (Kr.).

Parathemisto oblivia, (Krøyer).
Lanceola Clausi, Bovallius.
Eusirus Holmi, Hansen.
Amphithopsis glacialis, Hansen.

Calanus finmarchicus, (Gunn.).
— *hyperboreus*, Krøyer.
Scaphocalanus acrocephalus, G. O. Sars.
Scolecithrix brevicornis, G. O. Sars.
Undinella oblonga, G. O. Sars.

Digitized by Google

Euchæta norvegica, Boeck.
Undeuchæta spectabilis, G. O. Sars.
Chiridius armatus, (Boeck).
— *tenuispinus*, G. O. Sars.
— *brevispinus*, G. O. Sars.
Heterochæta norvegica, Boeck.
— *compacta*, G. O. Sars.
Augaptilus glacialis, G. O. Sars.
Hemicalanus spinifrons, G. O. Sars,
Metridia longa, (Lubb.).
Temorites brevis, G. O. Sars.

Conchoecia maxima, Brady & Norm.
Sagitta (Spadella).
No algæ.

No. 4.

October 12th, 1895.

85° 13′ N. Lat., 79° E. Long.

Amphithopsis glacialis, Hansen.

Calanus finmarchicus, (Gunn.).
— *hyperboreus*, Kr.
Scaphocalanus acrocephalus, G. O. Sars.
Undinella oblonga, G. O. Sars.
Chiridius brevispinus, G. O. Sars.
Heterochæta norvegica, Boeck.
— *compacta*, G. O. Sars.
Augaptilus glacialis, G. O. Sars.
Metridia longa, (Lubb.).
Temorites brevis, G. O. Sars.
No algæ.

Digitized by Google

No. 5.

February—May, 1896.

The most westerly part of the 'Fram's' route.

Between 84° 47′ and 83° 57′ N. Lat., and between 25° and 11° E. Long.

Thysanoëssa longicaudata, (Kr.).

Euthemisto libellula, (Mandt).
Parathemisto oblivia (Krøyer).
Lanceola Clausi, Bovallius.
Cyclocaris Guilelmi, Chevreux.
Pseudalibratus glacialis, G. O. Sars.
— *Nanseni*, G. O. Sars.
Paramphithoë brevicornis, G. O. Sars.
Metopa longicornis, Boeck.
Eusirus Holmi, Hansen.
Amphithopsis glacialis, Hansen.
Gammarus locusta L. var. *mutata*.

Calanus finmarchicus, (Gunn.).
— *hyperboreus*, Kr.
Scaphocalanus acrocephalus, G. O. Sars.
Euchæta norvegica, Boeck.
Chiridius armatus, (Boeck).
Heterochæta norvegica, Boeck.
Metridia longa, (Lubb.).
Conchoecia maxima, Brady & Norm.
Clione papilionacea, Pall. jun.
Sagitta (Spadella).
No algæ.

I further add here a list of species from a single locality, because in this instance it has been expressly stated that the sample was taken from the very surface of the sea, whereas in all other cases the tow-net was lowered to some considerable depth below the ice.

Digitized by Google

28th June, 1895.
84° 32′ N. Lat., 76° E. Long.
About midway in the route of the 'Fram'.
Sample taken by towing from a boat in a large open lane in the ice.

Parathemisto oblivia, (Krøyer).

Calanus finmarchicus, (Gunn.).
— *hyperboreus*, Kr.
Scaphocalanus acrocephalus, G. O. Sars.
Undinella oblonga, G. O. Sars.
Euchœta norvegica, Boeck.
Chiridius armatus, (Boeck).
— *tenuispinus*, G. O. Sars.
Heterochœta norvegica, Boeck.
— *compacta*, G. O. Sars.
Metridia longa, (Lubb.).
Temorites brevis, G. O. Sars.

Conchoecia maxima, Brady & Norm.
Sagitta (Spadella).
No algæ.

Of the 11 species of Copepoda enumerated from the above-named sample, 6 also occur off the Norwegian coast; but it is worthy of note, that all of them, except *Calanus finmarchicus*, are here confined to great depths, more than 100 fathoms. The above-named Hyperiid, *Parathemisto oblivia*, is also a pronounced deep-water form off our coasts, and the same is also the case with the 3 Norwegian species of *Conchoecia*, one of which, *C. borealis* G. O. Sars, is very closely allied to the arctic form here named.

In the following pages, I shall try to give an account of all the species of Crustacea found in the collections of the 'Fram', with notes on their occurrence and distribution, and with descriptions and figures of the new or less familiar forms.

The plates accompanying this account have been prepared by the autographic method employed by the present author in most of his recent publications, and will, I hope, serve for an immediate recognition of the species.

Digitized by Google

ACCOUNT OF THE SPECIES.

PODOPHTHALMIA.

Fam. CRANGONIDÆ.

1. *Sabinea septemcarinata* (Sab.).

A well-preserved larva in the last stage of this form (= *Myto Gaimardii*, Krøyer) is in the collection, having been taken by means of the tow-net on the 13th October, 1893, from a depth of about 50 metres.

Distribution. Coast of Norway, Atlantic coast of North America, Greenland, Spitsbergen, the Murman coast, the Kara Sea, the Bering Sea.

Fam. EPHYRIDÆ.

2. *Hymenodora glacialis* (Buchholtz).

Of this peculiar form, described and figured in detail by the present author in his account of the Crustacea of the Norwegian North Atlantic Expedition, a solitary young specimen was found in a sample taken on the 24th March, 1894, the tow-net having been lowered to a depth of 300 metres.[1]

Distribution. Greenland, several stations of the Norwegian North Atlantic Expedition (cold area), the Farŏe Channel, east coast of North America (Albatross Expedition).

Fam. EUPHAUSIIDÆ.

3. *Nyctiphanes norvegicus* (M. Sars).

A well-preserved specimen of this beautiful form was taken on the 22nd May, 1894, from a depth of 100 metres.

[1] That this form must have occurred rather plentifully in about the same tract, and in the very surface of the sea, is proved from the fact that easily recognizable remains of it were found in the stomachs of 8 specimens of the roseate gull (*Rhodostethia rosea*) shot between the 3rd and 8th August same year.

Digitized by Google

Distribution. Coast of Norway, Scotland, the Murman coast, Greenland, east coast of North America.

4. *Thysanoëssa longicaudata* (Krøyer).

Syn: *Thysanoëssa tenera*, G. O. Sars.

Solitary specimens of this form, in a more or less perfect state, were found in 4 different samples taken in places lying widely apart from each other (March 24th, 1894, July 30th, 1895, Feb. 4th, 1896, Feb. 13th, 1896), the tow-net having been lowered to a depth of between 50 and 300 metres

Distribution. Varanger Fjord, sea between Norway and Jan Mayen (Norw. North Atl. Exp.), Greenland.

AMPHIPODA.

Fam. HYPERIIDÆ.

1. *Euthemisto libellula* (Mandt).

This well-known arctic form was taken both at the beginning and close of the cruise, partly young, partly fully grown specimens. The greater number of the specimens are, however, from the western part of the region traversed.

Distribution. Coast of Finmark, the Murman coast, Novaja Semlja, Siberian Polar Sea, Beeren Eiland, Spitsbergen, Jan Mayen, Greenland.

2. *Parathemisto oblivia* (Krøyer).

This form also seems to be widely distributed throughout the Polar basin, having been taken along the whole route of the 'Fram' in no less than 12 different places.

Distribution. Coast of Norway, British Isles, Greenland, numerous stations of the Norwegian North Atlantic Expedition.

Fam. LANCEOLIDÆ.

Gen. *Lanceola*, Say.

Remarks. This genus was established by the American zoologist, Th. Say, as early as the year 1818, to include a peculiar Amphipod belonging to the Hyperiid group. But the genus was not recognized by subsequent authors, some of whom regarded it as synonymous with *Hyperia*, others

Digitized by Google

with *Vibilia*. It is to Dr. Bovallius that we owe the restoration of Say's genus, as he pointed out its difference from both *Hyperia* and *Vibilia*. Indeed, Dr. Bovallius even regards it as the type of a distinct family, *Lanceolidæ*, at the same time adding no less than 5 new species to that originally described by Say. Of these species, one has been found during the 'Fram' Expedition, and, as only a short diagnosis, accompanied by 4 figures in outline, has been given of it by Dr. Bovallius, I find it appropriate here to describe and figure this remarkable form more in detail.

3. *Lanceola Clausi*, Bovallius.

(Pl. I).

Lanceola Clausi, Bovallius, 'On some forgotten genera of Amphipoda'. Bihang till Kgl. Svenska Vet. Akad. Handl. Part 10, p. 8.

The *Same:* 'Arctic and Antarctic Hyperids'. Vega-Expeditionens vetensk. arbeten, vol. IV, p. 553, Pl. 41, figs. 11—14.

Description.

The largest specimen in the collection, the one here figured, has a length of about 10 mm.; but, as Dr. Bovallius gives the length as 16 mm., it cannot be fully grown.

True, at first sight, the specimen here figured (see Pl. I. fig. 1) has the appearance of being an adult gravid female, with largely protuberant marsupium; but, on a closer examination, it is easily seen that this impression is merely due to a delusion. For the fact is that no marsupium at all is formed, and the protruding part that has this appearance, is nothing but the ventral walls of the body itself, along the middle of which, immediately beneath the skin, the ganglionic chain may be very distinctly traced. Indeed, the anterior part of the body-cavity is enormously dilated, in order to give room for the exceedingly capacious stomachal part of the intestine.

The integuments are remarkably soft and supple, and the whole body thereby acquires a peculiar vagueness in its contours, not observed in other Amphipods. As the metasome generally is bent in against the greatly swollen mesosome, the whole body looks like an irregular, soft ball.

The cephalon, unlike what is the case in the true *Hyperiids*, is very small, and abruptly truncated in front, with the anterior face somewhat concave, and bounded above by a projecting, rostrum-like angle. Between the

Digitized by Google

insertion of the 2 pairs of antennæ, it forms, on each side, a slight rounded lobe, within which the very small eyes have their place, and below, it terminates on each side in another obtuse lobe, with which the buccal mass is connected.

The segments of the mesosome are well defined in their dorsal part, exhibiting laterally an even horizontal margin, with which the extremely small coxal plates are connected; but the protruding ventral part of the 2nd to 5th segments seems to form a continuous whole. The 1st segment is rather short, scarcely exceeding in length the cephalon, whereas the 3 succeeding segments are of considerable size, the 3rd and 4th each exhibiting in front an elevated transversal eminence defined behind by a distinct depression. The 3 posterior segments rapidly diminish in size; the last 2 do not exhibit any protuberant ventral part, and on the whole are very similar in appearance to the 3 succeeding segments belonging to the metasome. The epimeral plates of the latter are comparatively small and evenly rounded.

The urosome (see also fig. 16), as in the true *Hyperiids*, is depressed, and composed of 2 segments only, the last 2 being wholly fused together. The whole posterior division of the body, comprising the metasome and urosome, scarcely attains half the length of the anterior, and this is regarded by Dr. Bovallius as a distinctive character, separating the present species from some of the others. It is very probable, however, that in the male this division is much more fully developed than in the female.

The eyes, contrary to what is the case in the true *Hyperiids*, are extremely small, rounded, and composed of a restricted number of visual elements, imbedded in a light red pigment.

The superior antennæ (see figs. 2, 3) issue at rather a long distance from the upper angle of the head, and widely apart from each other. They are apparently composed of only 3 joints, the first 2 constituting the peduncle, the 3rd the flagellum. Of the peduncular joints, the 1st is the larger, and is defined from the 2nd by a deep constriction. It may be that, as indicated by Dr. Bovallius for the type species, there is a very short intermediate joint in the peduncle; but I have not been able to see such a joint with any distinctness in the specimens I have examined. The terminal joint, or flagellum, is somewhat longer than the peduncle, compressed, lanceolate, and edged with very small sensory bristles. Any apical joints, I have failed to distinguish.

Digitized by Google

The inferior antennæ (see figs. 2 & 4) are a little longer and more slender than the superior, and have the peduncle composed of 4 joints, the last of which is the largest. The flagellum, as in the superior antennæ, is uniarticulate, forming a somewhat flattened, narrow, lanceolate joint, terminating in a straight, slender spine.

The buccal mass (see figs. 1 & 2) is rather protuberant, and composed of the usual number of oral parts mutually covering each other.

The anterior lip (see figs. 2 & 5) forms a comparatively small, deeply bilobate flap, covering the masticatory parts of the mandibles, and having the edge quite smooth.

The posterior lip (fig. 6) is much larger, with the lateral lobes greatly divergent, and each terminating in an oval, somewhat recurved lappet.

The mandibles (see figs. 2 & 7) are in the form of 2 flattened, almost horizontally arranged pieces meeting in front, below the anterior lip. They do not exhibit any trace of a true molar prominence; but the inner face is rough owing to the presence of numerous small hair-like spinules. The cutting edge is simple, with the upper corner acutely produced, the lower more obtuse, and exhibiting a very small tooth-like projection. On the left mandible, just within the upper corner of the cutting edge, there is an extremely small bidentate prominence, constituting a rudiment of a secondary cutting plate. The palp is well developed, being considerably longer than the body of the mandible, and is composed of 3 well-defined joints. Of these the 1st is rather short, whereas the 2nd is elongated and somewhat compressed, exhibiting inside 4 short spiniform bristles, outside in the outer part, several slender setæ. The terminal joint is shorter than the 2nd, and conically tapered, with a delicate ciliation along the inner edge.

The anterior maxillæ (see figs. 2 & 8) exhibit all the chief parts found in typical Amphipoda. The masticatory lobe is densely hairy and divided at the somewhat oblique end into 4 strong teeth. The basal lobe is rather short, and likewise densely hairy, but without any true spines or setæ. The palp consists of only a single lamellar joint of oblong oval form, and partly covering the masticatory lobe outside. It is edged with short spinules, those on the inner margin being extremely small and densely crowded together. From the outer side of the basal part, moreover, several strong bristles are seen to originate.

Digitized by Google

The posterior maxillæ (see figs. 2 & 9) are likewise quite normal in their construction. The basal part is rather voluminous and muscular, and the 2 terminal lobes are comparatively narrow and strongly incurved. Both lobes are densely hairy, and the somewhat larger outer lobe is, moreover, armed at the tip with several strong spines.

The maxillipeds (see figs. 2 & 10), as in other *Hyperiida*, are quite destitute of palps. The broad, flattened basal part consists of a short common root-joint, and 2 juxtaposed lamellar pieces, each carrying outside a single seta, and projecting at the end inside in a short triangular lappet. These lappets, which lie in close juxtaposition, and are fringed with short bristles, undoubtedly answer to the basal lobes in other Amphipoda. It is likewise indubitable that the large lamellæ appended to the end of the basal part, represent the masticatory lobes in other Amphipoda, exhibiting, as they do, a very similar appearance. They are oblong oval in form, and, being movably articulated to the basal part, they may either be extended straight in front, or be spread out, so as to diverge more or less widely. Along the straight inner edge, there is a double row of strong spiniform bristles, and each of the lobes also carries outside, at some distance from the tip, 2 similar bristles springing from a distinct ledge.

The 2 pairs of gnathopoda (figs. 11, 12) are of essentially similar structure, being considerably shorter and thicker than the pereiopoda, and also more abundantly supplied with bristles. They are quite simple, without any trace of a cheliform structure, the propodal joint being conically tapered, and carrying at the tip the small dactylus. This joint is rather more produced in the posterior than in the anterior pair; but in none of them is there any distinctly defined palm.

The 2 anterior pairs of pereiopoda (fig. 13) are of quite normal appearance, and moderately slender. Of the joints, the carpal and propodal ones are somewhat compressed, and are both provided along the posterior edge with a row of short spinules. The dactylus is comparatively small and quite simple.

The 3 posterior pairs of pereiopoda (figs. 14, 15) gradually diminish somewhat in length, and are all distinguished by the peculiar arrangement of the dactylus. The latter is strongly curved, finely denticulated along the concave edge, and exserted in a very acute point. It is, moreover, retractile, and capable of being received into a hollow formed by a cup-like projection of

Digitized by Google

the propodal joint (see figs. 14 a, 15 a). Otherwise, these legs are remarkably smooth, and have the basal joint scarcely broader than on the 2 anterior pairs.

The branchial lamellæ are comparatively small, and are present on the posterior gnathopoda and the 4 anterior pairs of pereiopoda (see figs 1, 12, 13, 14). In the specimen examined, slight rudiments of incubatory plates were present inside the branchial lamellæ (see figs. 12, 13).

The pleopoda are rather powerfully developed, and of normal structure.

The uropoda (see fig. 16) exhibit the structure usually met with in *Hyperiids*, the terminal rami being lanceolate in form, with the edges finely serrulate (see fig. 17). The last pair do not differ from the 2 preceding ones, except in the somewhat greater breadth of the basal part.

The telson (ibid.) is oblong triangular in form, and quite simple, without any armature. It does not reach to the end of the basal part of the last pair of uropoda.

Occurrence. This peculiar Amphipod occurred in 6 different samples, 5 of which were taken along the eastern part of the route of the "Fram", between latitudes 80° and 85°, the 6th much farther west, at about the 30th degree of longitude, and near the 85th degree of latitude. In all the places, the tow-net had been lowered to depths of between 100 and 300 metres. By far the greater number of the specimens found are very small, and evidently quite young. Only in one place were 2 larger specimens caught, one of which is that here described.

Distribution. Davis Straits, in lat. 72° N. (Bovallius).

Fam. SCINIDÆ.

4. *Scina borealis*, G. O. Sars.

Some specimens of this easily recognizable form were found in 3 samples collected towards the end of March and in the beginning of April, 1894, in about the 80th degree of latitude, the tow-net having been lowered, in all 3 places, to a depth of 300 metres.

Fam. LYSIANASSIDÆ.

Gen. *Cyclocaris*, Stebbing.

Remarks. This genus was established in the year 1888 by the Rev. Mr. Stebbing, to include a peculiar Amphipod from the Challenger Expedition,

Digitized by Google

the solitary specimen procured having been taken in the Pacific, at some distance from Tahiti. The genus was justly placed in the extensive family *Lysianassidæ*, though in some characters it differs rather markedly from the other known genera. It was, indeed, very surprising to find this genus represented in the Polar Sea by a well-marked and very beautiful species; and I had intended to dedicate it to our celebrated explorer, Prof. Nansen. The same species, however, has been quite recently recorded by M. E. Chevreux from the Expedition of the Prince of Monaco, and, as nothing has as yet been published about the Crustacea of the Nansen Expedition, the name proposed by M. Chevreux for this species ought of course to be retained. The species will be described in detail below.

5. *Cyclocaris Guilelmi*, Chevreux.
(Pl. II & III).

Cyclocaris Guilelmi, E. Chevreux, Bulletin de la société zoologique de France, T. XXIV, 1899, p. 148.

Remarks. The present species is nearly related to the Pacific form described by the Rev. Mr. Stebbing as *C. tahitensis*, though evidently specifically distinct, being not only of considerably larger size, but also differing in some of the structural details, as will be seen by comparing the figures here given with those reproduced in Mr. Stebbing's work. On the other hand, no doubt can arise as to the identity of the Polar form with that recorded by M. Chevreux under the above name.

Description of the Female.

The length of the largest specimens in the collection is about 18 mm. Those examined by M. Chevreux were somewhat smaller, measuring from 11 to 12 mm.

The general form of the body (see Pl. II, fig. 1) is moderately slender and somewhat compressed, with the mesosome slightly exceeding in length the metasome and urosome combined. The back is quite smooth throughout, and generally slightly curved.

The cephalon (see also fig. 2) is rather thick and massive, and, from a lateral point of view, quadrangular in form, being transversely truncated

Digitized by Google

in front. Its lateral faces are perfectly smooth, and almost wholly occupied by the unusually large, but very imperfectly developed eyes, which extend above, so as to meet along the dorsal line. The upper angle of the head forms a very small rostral projection, curved down between the bases of the superior antennæ; the lower corners are somewhat more prominent, and between them and the rostral projection, the anterior edges of the head appear very slightly curved. The inferior boundary of the lateral faces is not, as usual, emarginated or incised, but forms on each side an uninterrupted, gently curving line.

Of the segments of the mesosome, the 1st is considerably longer than the 2nd, which is comparatively very short, both together about equal in length to the cephalon. The succeeding segments gradually increase somewhat both in length and depth, the last, however, being scarcely larger than the penultimate one. The 2 anterior pairs of coxal plates are very small, and partly concealed by the 3rd pair, which are much deeper than the corresponding segment, gradually expanded distally, and extended obliquely in front, so as to reach the hind edge of the cephalon (see fig. 1). The 4th pair of coxal plates are still larger, and, as usual, emarginated behind, projecting below the emargination in an obtuse lobe. The 3 posterior pairs of coxal plates are not nearly so deep as the 2 preceding pairs, and are transversally oval in form, slightly decreasing in size posteriorly.

The epimeral plates of the metasome (see figs. 1 & 3) are of moderate size, the anterior pair being obtusely rounded, whereas the 2 posterior pairs are acutely produced behind, with the inferior edge fringed with delicate bristles.

The 3 segments of the urosome are well defined, and combined are about half as long as the metasome. The 1st segment exhibits a slight dorsal depression, and the 2nd is very short. In none of the segments could any spines or bristles be detected.

The eyes (see figs. 1 & 2), as above stated, are of quite enormous size, not only occupying the greater part of the lateral faces of the cephalon, but also extending dorsally, so as to meet in the middle. Their structure, however, is very imperfect, there being no trace of any refracting elements, but only simple, rod-like fibres, imbedded in a dark red pigment. In specimens that have been a long time in strong alcohol, the ocular pigment very soon disappears, as is also often the case in other *Lysianassidæ*. In such

Digitized by Google

specimens, the eyes appear to be altogether wanting, as indicated by M. Chevreux; but in some of the specimens from the Nansen Expedition, that have been preserved in a weaker solution of alcohol, the ocular pigment was still easily observable, though it had somewhat changed its original colour; and in these specimens the actual presence of eyes, and their enormous size could be proved with full certainty.

The superior antennæ (fig. 4) are comparatively short, about as long as the cephalon and the 2 anterior segments of the mesosome combined, and they exhibit the structure generally met with in the *Lysianassidæ*. The peduncle is short and thick, with the 2 outer joints very small. The flagellum is about twice the length of the peduncle, and is composed of 12 articulations, the 1st of which is rather large, sublaminar, and densely clothed inside with delicate sensory filaments. At the tip, this articulation, like the 3 succeeding ones, carries a rigid bristle. The accessory appendage is fully half the length of the flagellum, and is composed of 6 articulations, the 1st of which is much the largest.

The inferior antennæ (fig. 5), which issue at some distance below the superior, are about twice as long as the latter, and have the first 2 joints of the peduncle quite concealed by the antero-lateral corners of the cephalon (see fig. 2). The 2 outer joints of the peduncle are of about equal length, and are both clothed anteriorly with short bristles. The flagellum is rather slender, being fully twice as long as the peduncle, and composed of about 30 short articulations.

The buccal mass (see figs. 1 & 2) is greatly protuberant, and wholly uncovered laterally, protruding in front somewhat beyond the anterior edge of the cephalon. The peculiar structure of the mandibles and maxillipeds is easily observable, even without dissection.

The anterior lip (fig. 6) is comparatively small, exhibiting a median convex part, and 2 rounded lateral expansions.

The posterior lip (fig. 7) is much larger, with the lateral lobes widely apart, and each projecting behind in a narrow process pointing straight posteriorly.

The mandibles (fig. 8) are pronouncedly laminar, and without any trace of a molar process[1]. The cutting edge is quite simple, straight, and sharp,

[1] Such a process is certainly described by M. Chevreux; but I believe that in this case he has fallen into an error, by mistaking the chitinous tendon of the rotatory muscle of the mandible for a process of this kind.

Digitized by Google

with only a very small dentiform projection at each corner. Inside the masticatory part, there is a row of thick ciliated spines extending from the lower corner of the cutting edge to about the end of the inner third part of the mandible, and at some distance from its posterior edge (see fig. 9). Anteriorly, at some distance from the cutting edge, each mandible forms an angular projection, outside which the palp is articulated. The latter is rather slender, but scarcely longer than the body of the mandible, and has the terminal joint narrow lanceolate, and shorter than the medial one, both being fringed inside with a row of delicate bristles.

The anterior maxillæ (fig. 10) exhibit quite a normal appearance. The terminal joint of the palp is divided at the tip into several strong teeth, which, as usual, slightly differ in the 2 maxillæ. The masticatory lobe is rather prominent, and is armed at the tip, and along the inner edge, with several strong spines. The basal lobe is of moderate size, and slightly curved, and carries inside 9 plumose setæ.

The posterior maxillæ (fig. 11) have both lobes rather narrow, the outer one being by far the larger. Both lobes are densely clothed along their inner edge with partly ciliated setæ.

The maxillipeds (fig. 12) are prominently characterised by the enormous development of the masticatory lobes, which form very large, broadly oval plates reaching beyond the penultimate joint of the palps, and easily observable on viewing the animal from the side (see figs. 1 & 2). They have the inner edge straight and minutely serrate, the tip obtusely truncate, and the outer edge slightly curved, with a row of delicate bristles. The basal lobes are obliquely truncated at the end, and each provided inside with a row of strong setæ. The palps are comparatively slender, and gradually taper distally, the last joint being rather narrow, oblong, and, like the other joints, clothed with scattered bristles.

The anterior gnathopoda (Pl. III, fig. 1) are very slender and but scantily setiferous. Of the joints, the ischial one is unusually prolonged, being of about the same length as the carpal one. The propodal joint is somewhat shorter than these joints, and gradually tapers distally, without exhibiting any distinctly defined palmar edge. The dactylus is comparatively small, and somewhat compressed (see fig. 1 a).

Digitized by Google

The posterior gnathopoda (fig. 2) exhibit the structure characteristic of the *Lysianassidæ*, being extremely slender and flexible, and very frequently bent in such a manner as not to be visible externally. The 2 outer joints are densely clothed with fine hairs, and carry, moreover, fascicles of slender bristles. The propodal joint is oblong oval in form, and exceeds half the length of the carpal one. It is narrowly truncated at the tip, and carries on the upper corner the very small curved dactylus (see fig. 3 a).

The 2 anterior pairs of pereiopoda (figs. 3, 4) are of moderate length, and quite normal in structure.

The 3 posterior pairs (figs. 5, 6, 7), on the other hand, are more elongated than in most other *Lysianassidæ*, and slightly increase in length posteriorly The basal joint is rather large and laminar, being obliquely rounded in the anterior pair (fig. 5), and in the 2 other pairs (figs. 6 & 7) more pyriform in outline. In all 3 pairs, the posterior edge is for some distance minutely serrate, and the infero-posteal corner drawn out to an obtusely rounded lobe. The outer part of the legs is fringed on both edges with fascicles of short spines, and has the propodal joint rather elongate and sublinear in form. The dactylus is of moderate length, and but slightly curved.

The branchial lamellæ are present at the base of all the legs, except the 1st pair (the anterior gnathopoda), and are of moderate size, with a small secondary lobe inside (see figs. 2—7). The incubatory plates (not fully developed in the specimen examined) are very narrow.

The pleopoda are of quite normal structure.

The uropoda, however, somewhat differ from those in other *Lysianassidæ*. The two anterior pairs (figs. 8, 9) have both rami lanceolate in form, terminating in a simple, naked point, and carying on the edges short scattered spinules, the outer ramus in both pairs being shorter, and also narrower, than the inner. The last pair (fig. 10), as usual, have the basal part shorter and thicker than in the 2 preceding pairs, whereas the rami are comparatively larger, so as to project beyond those of the above-mentioned pairs. The inner ramus is uniarticulate and lanceolate in form, with the inner edge densely setiferous; the outer ramus, on the other hand, is distinctly biarticulate, the distal joint being spiniform, and projecting a little beyond the inner ramus.

The telson (fig. 11) is remarkable from its large size, as it exceeds half the length of the urosome. It is narrow lanceolate in form, and cleft nearly to

Digitized by Google

the base by a very narrow fissure. Each of the lateral halves terminates in a very acute point, and exhibits a row of about 7 small sub-marginal denticles.

The colour in the living state of the animal, according to notes of Dr. Nansen, is bright red, with somewhat darker eyes.

Occurrence. Several specimens of this interesting Amphipod were taken on the 23rd and 24th April, 1894, at about the 80th degree of latitude, clinging to the sounding-line, the latter having been lowered to a depth of between 500 and 1000 metres. As in every instance the specimens were found on the lower part of the line, at only a short distance from the water-bottle, it must be assumed that they in reality occurred in the deepest strata, near the bottom.

A single specimen was also found in a sample taken a little farther south, on the 23rd March same year, the tow-net having been lowered to 300 meters. Finally, the same form occurred in a sample taken on the 4th February, 1896, in a place lying much farther west, and north of the 85th degree of latitude, the tow-net having in this instance been lowered to only 100—130 metres. By far the greater number of the specimens caught here were, however, of rather small size, only 2 of them being apparently fully grown. From its occurrence in this place, it must be inferred that this Amphipod is not strictly a bottom-form, but, like the species of the genus *Pseudalibrotus*, sub-pelagic in habits, though at times descending to very great depths.

Distribution. Off the Lofoten Islands, taken by the aid of the bow-net ('nasse'), in a depth of 1095 metres (Expédition du Prince de Monaco).

Gen. *Pseudalibrotus*, Della Valle.

Syn: *Alibrotus*, G. O. Sars (not M.-Edw.).

Remarks. This genus was proposed by Signor Della Valle in his great works on the Gammarids of the Gulf of Naples, to include the well-known arctic species *Anonyx littoralis* of Krøyer, which I had erroneously referred to the genus *Alibrotus* of Milne-Edwards. In addition to the above-named arctic form, 2 new species of this genus have been recently described by the present author from the Caspian Sea, both belonging to the collection of Dr. O. Grimm. I have now to report 2 additional species, found in the material collected during Nansen's North Polar Expedition, both of

Digitized by Google

which are quite distinct from the previously known arctic form, *P. littoralis*, but, on the other hand, are so closely related to the 2 Caspian species, that I am much inclined to regard them as the primitive forms from which the latter are descended.

6. *Pseudalibrotus Nanseni*, n. sp.
(Pl. IV, V).

Specific Characters. Body comparatively robust, with broadly rounded back. Cephalon with the lateral lobes rather prominent and angular at the tip; postantennal angle well marked. Eyes of moderate size, oval, somewhat contracted above. 1st pair of coxal plates but slightly expanded, and obtusely truncated at the tip. The 2 posterior pairs of epimeral plates of metasome acutely produced behind. 1st segment of urosome with a distinct saddle-like depression dorsally. Antennæ rather slender and elongated, especially in the male, flagellum of both pairs in the latter provided with well developed calceolæ, accessory appendage of the superior ones 4—5 articulate. Anterior gnathopoda somewhat smaller than in the type species; posterior ones with the propodal joint transversally truncated at the tip, carrying the small dactylus about in the middle of the terminal edge. The 3 posterior pairs of pereiopoda much less slender than in the type species, with the basal joint very large and lamellar, oblong oval in form, and coarsely serrate behind; last pair considerably shorter than the preceding pair, with the outer part scarcely more than half the length of the basal joint. Last pair of uropoda comparatively short, scarcely reaching beyond the others, structure about as in *P. littoralis*. Telson rather large, reaching to the end of the basal part of the last pair of uropoda, rounded quadrangular in form, tip slightly insinuated. Length of adult male about 20 mm.

Remarks. This species is easily distinguishable from *P. littoralis* by its more robust form, and more especially by the structure of the posterior pairs of pereiopoda, the outer part of which is remarkably short in proportion to the basal joint. It more resembles the Caspian species, *P. platyceras* (Grimm), to which, indeed, I believe it stands in direct genealogical relation, although, on a closer comparison, several differences may be found between them, which make it necessary to keep the two species apart. I propose to name

Digitized by Google

this form in honour of Dr. Nansen, who also took special notice of it during the Expedition.

Description.

The largest specimens in the collection have a length of about 20 mm., and this is accordingly a rather large-sized form, considerably exceeding in size the type species, and about equalling in this respect the Caspian species, *P. platyceras* (Grimm).

The form of the body (see Pl. IV, fig. 1), as compared with that of *P. littoralis*, is rather more robust and less compressed, the back being broadly rounded and perfectly smooth throughout. In the adult male, the posterior division of the body, comprising the metasome and urosome, is fully as long as the anterior; but this is scarcely the case in the female, in which the metasome is less powerfully developed.

The cephalon is comparatively short, not nearly as long as the first 2 segments of the mesosome combined, and has the lateral lobes rather prominent and distinctly angular at the tip (see also fig. 2). The lower edges are deeply emarginated, to encompass the globular basal joint of the inferior antennæ, and behind the latter they project in an acute angle, the postantennal corner.

The segments of the mesosome gradually increase in size posteriorly, none of them being, however, as large as the segments of the metasome. The 4 anterior pairs of coxal plates are considerably deeper than the corresponding segments, and not very different in size. The 1st pair, however, are a little broader than the 2 succeeding ones, and slightly expanded distally, with the tip transversely truncated (see also fig. 14). The 4th pairs, as in the other species of this genus, are narrower than in most other *Lysianassidæ*, and but very slightly emarginated behind. The 3 posterior pairs of coxal plates are rather large, though somewhat less deep than the anterior, and are rounded quadrangular in form, gradually diminishing somewhat in size posteriorly.

The epimeral plates of the metasome are well developed, the 1st pair being rounded, whereas the 2 posterior pairs are each drawn out behind to an acute point.

Digitized by Google

The urosome is scarcely half as long as the metasome, and exhibits dorsally, at the base of the 1st segment, a well-marked saddle-like depression.

The eyes (see figs. 1 & 2) are clearly distinguishable, though their pigment, which originally has undoubtedly been of a light red colour, has become absorbed in the specimens by the action of the alcohol. They are of moderate size, and irregularly oval in form, being somewhat contracted in their upper part. The visual elements seem to be normally developed.

The antennæ, as in the other species of this genus, have the flagella more produced than is usually the case in the present family. They are rather more slender in the male than in the female (*conf.* figs. 1 and 2); but the relative length of both pairs is approximately the same in the two sexes, the inferior one being a little longer than the superior. In the male, the latter (see figs. 1, 3) are about the length of the whole mesosome, and have the peduncle very thick and massive, with the 2 outer joints, as usual, very short. The flagellum is composed of numerous articulations, amounting to about 50 in all, the 1st being very large and tumid, and clothed inside with numerous sensory hairs, arranged in 2 sets. The succeeding articulations each carry at the hind edge a well developed calceola of exactly the same structure as those on the inferior antennæ (figs. 6, 7). The accessory appendage exceeds half the length of the peduncle, and is composed of 5 articulations, the 1st being much the largest.

The inferior antennæ (fig. 4) have the basal joint globular and wholly exposed (*conf.* fig. 2). Of the 4 remainings joints of the peduncle, the penultimate is the largest, and is clothed on both edges with short bristles. The flagellum in the male is extremely slender and fully 3 times as long as the peduncle, being composed of about 60 articulations, which are provided anteriorly with well developed calceolæ, arranged alternately (see fig. 5). When viewed under a high magnifying power, each calceola (see figs. 6, 7) is found to consist of a short peduncle carrying at the end an oboval, slightly concave sucking disc, which extends somewhat obliquely and terminates in a very thin and hyaline, spatulate rim.

In the female, as above stated, both pairs of antennæ (see fig. 2) are somewhat shorter, and no trace of calceolæ is found on the flagella, which, moreover, are composed of a smaller number of articulations.

Digitized by Google

The buccal mass is more or less completely concealed laterally by the anterior coxal plates, so that only the mandibular palps and the maxillipeds are partly exposed (see fig. 1).

The anterior lip is simple, rounded, and the epistome not projecting.

The posterior lip (fig. 8) has the lateral lobes narrowed in front, and slightly bilobular at the tip, each being produced behind to a conical process.

The mandibles (figs. 9, 10) are very strong, with the masticatory part somewhat incurved and divided into a narrowly truncated cutting part, and a short, but distinctly prominent molar expansion, exhibiting at the tip a finely fluted triturating surface. The palp (see fig. 9) is greatly developed, considerably exceeding the body of the mandible in length, and has the last joint falciformly curved.

The anterior maxillæ (fig. 11) exhibit the usual structure. The masticatory lobe is rather prominent, and carries at the tip several strong spines, the inner edge being covered with fine hairs, and moreover armed with from 3 to 4 somewhat smaller spines. The basal lobe is comparatively small, with only 2 plumose setæ at the tip. The last joint of the palp is but slightly dilated and is, as usual, denticulated at the tip.

The posterior maxillæ (fig. 12) have the inner lobe rather small, scarcely more than half as large as the outer, both exhibiting the usual dense clothing of setæ.

The maxillipeds (fig. 13) on the whole agree in structure with those in the other species of the genus. The masticatory lobes are not very large, scarcely reaching beyond the middle of the penultimate joint of the palp, and are oval in form, with the inner edge minutely serrate. The basal lobes are narrowly truncated at the tip, and carry the usual setæ. The palps are rather large, with the joints somewhat expanded and densely setiferous.

The anterior gnathopoda (fig. 14) are somewhat less strong than in the type species, with the outer part scarcely longer than the basal joint. The propodos is about the length of the 2 preceding joints combined, and is obliquely truncated at the tip, exhibiting a well defined palm, which is armed at the inferior corner with several strong denticles.

The posterior gnathopoda (Pl. V, fig. 1) differ from those in the type species chiefly in the propodos being somewhat broader and more transversely truncated at the tip, with the lower corner scarcely at all produced.

Digitized by Google

The 2 anterior pairs of pereiopoda (figs. 2, 3) are quite normal in structure.

The 3 posterior pairs (figs. 4, 5, 6) are, however, distinguished by the large size of the basal joint, as compared with the terminal part. The last pair (fig. 6) especially, look rather different from those in the other known species, being considerably shorter than the preceding pair, with the terminal part not exceeding even half the length of the basal joint. The latter is very large, laminar, and oblong quadrangular in form, with the infero-posteal corner produced to an obtusely rounded lobe. The posterior edge of this joint in all 3 pairs is coarsely serrate throughout.

The branchial lamellæ (see figs. 1—5) are rather large, but quite simple in structure, without any lateral lobes. They are wanting on the last pair of legs (fig. 6).

The 2 anterior pairs of uropoda (figs. 9, 10) have the rami quite simple, and mucronate, whereas in the type species, as shown by the present author, the inner ramus of the 2nd pair is peculiarly transformed.

The last pair of uropoda (see figs. 8, 11) are comparatively short, scarcely reaching beyond the others. In structure they resemble those in the type species, both rami, but especially the outer one, being fringed with ciliated setæ in addition to the spinules.

The telson (see figs. 8, 12) is rather large, laminar, and reaches to about the end of the basal part of the last pair of uropoda. It is rounded quadrangular in form, and slightly narrowed distally, with the terminal edge distinctly insinuated in the middle, and armed on each side with a minute denticle.

Occurrence. Some adult specimens of this form, chiefly of the male sex, were collected during the months March and April, 1894, in about 80° latitude, north of the New Siberian Islands. The specimens seem not to have been taken by the aid of the tow-net, but on bait hung down from the ship. Moreover, some young specimens of this species occurred in a sample taken on the 4th February, 1896, and much farther west, near the 85th degree of latitude.

Digitized by Google

7. *Pseudalibrotus glacialis*, n. sp.
(Pl. VI).

Specific Characters. Body somewhat less robust than in the preceding species, and more compressed, with the back evenly rounded. Cephalon with the lateral lobes distinctly angular at the tip; eyes oval, with the visual elements sometimes distinct, at others imperfectly developed. Anterior pairs of coxal plates deeper than the corresponding segments; 1st pair rather broad and expanded, with the antero-lateral corner rounded off; 5th pair more than twice as large as the last. The 2 posterior pairs of epimeral plates of metasome acut-angular behind. Urosome slightly depressed at the base dorsally. Antennæ comparatively shorter than in the preceding species, scarcely exceeding half the length of the mesosome, flagella of both pairs composed of a smaller number of articulations, accessory appendage of the superior ones 3-articulate. Anterior gnathopoda about as in the preceding species; posterior ones, however, differing in the propodos being obliquely truncated at the tip, with the lower corner produced, so as to form, with the extremely small dactylus, a minute chela. The 3 posterior pairs of pereiopoda somewhat less robust than in the preceding species, with the terminal part more produced; last pair scarcely shorter than the preceding pair, with the basal joint rather broad in proportion to its length, and but little longer than the terminal part. Last pair of uropoda comparatively short, not projecting beyond the others, inner ramus considerably shorter than the outer, with only a single denticle inside, both rami without any marginal setæ. Telson rounded quadrangular in form, and but very slightly narrowed distally, terminal edge scarcely at all insinuated. Length about 9 mm.

Remarks. This species is nearly related to the preceding one, but is of much smaller size, and moreover easily distinguished by the different form of the anterior pair of coxal plates, the much shorter antennæ, and the less shortened terminal part of the last pair of pereiopoda. The posterior gnathopoda, too, terminate in a somewhat different manner, and the structure of the last pair of uropoda and of the telson is also somewhat different. In all these characters, it approaches still nearer to the Caspian species, *P. caspius* (Grimm), and in my opinion, it ought, indeed, to be regarded as the primitive form, from which this species has descended. Yet on a closer comparison,

Digitized by Google

there are to be found some minor differences between these two forms, so that it will be advisable to keep them apart.

In the material collected during the Nansen Expedition, there are two distinct varieties, the one with the eyes normally developed and probably, in the fresh state, provided with light red pigment, the other with the visual elements imperfectly developed, and the pigment of a whitish colour. A specimen of the latter variety, which may be named *var. leucopis*, is represented on Pl. VI fig. 10. Both these forms agree in other respects completely, and were also found together in the same samples.

Any more detailed description of this species, I do not consider it necessary to give here.

Occurrence. Numerous specimens of this form occurred in two samples taken on the 4th and 13th February, 1896, near the 85th degree of latitude, the tow-net having been lowered to from 50 to 130 metres. Moreover, two specimens were found in another sample taken on the 21st February, 1894, much farther east.

Fam. PARAMPHITHOIDÆ.

8. *Paramphithoë brevicornis*, G. O. Sars,

The anterior half of a specimen of this form was found in a sample taken on the 4th February, 1896, near the 85th degree of latitude.

Distribution. Coast of Finmark, Spitsbergen.

Fam. AMPELISCIDÆ.

9. *Hoploöps tubicola*, Lilljeborg.

Two specimens of this well-known form were found in a bottle containing different bottom-animals taken by the aid of the trawl on the 30th October, 1893, at some distance north of the New Siberian Islands, the depth being 90 metres.

Distribution. Coast of Norway, British Isles, coast of France, Kattegat, the Baltic, Greenland, Labrador, Iceland, Spitsbergen, the Barents Sea, the Kara Sea.

Digitized by Google

10. *Haploöps setosa*, Boeck.

A single specimen of this species was taken in the same haul as the preceding one.

Distribution. Coast of Norway, Greenland, the Kara Sea, Iceland, the Barents Sea, Beeren Eiland, Spitsbergen.

Fam. STENOTHOIDÆ.

11. *Metopa longicornis*, Boeck.

This species occurred in 4 samples, 2 of which were taken on the 13th and 24th October, 1893, at the beginning of the drifting of the 'Fram', the other 2 on the 4th and 13th February, 1896, much farther west, and near the 85th degree of latitude. The specimens were accordingly taken by the aid of the tow-net, which was lowered to a depth of from 20 to 100 metres.

Distribution. Coast of Norway, Greenland.

Fam. EUSIRIDÆ.

12. *Eusirus cuspidatus*, Krøyer.

A single young specimen of this arctic form was found in a sample taken on the 19th April, 1894, north of the New Siberian Islands, the tow-net having been lowered to a depth of 40 metres.

Distribution. Coast of Finmark, Greenland, Spitsbergen.

13. *Eusirus Holmi*, Hansen.

Of this species, recently described by Dr. Hansen from the Kara Sea, there are 3 specimens in the collection, 2 of them being found in a sample taken 26th March to 4th April, 1895, the 3rd in another sample taken on the 4th February, 1896, the tow-net having been lowered to a depth of from 100 to 130 metres.

Distribution. The Kara Sea, Stat. 18 and 124 of the Norw. North Atl. Exped. (recorded as *E. cuspidatus*).

Fam. CALLIOPIIDÆ.

14. *Amphithopsis glacialis*, Hansen.

This form, first described by Dr. Hansen from Greenland specimens, occurred in no less than 9 different samples, taken along nearly the whole

Digitized by Google

route of the 'Fram'. The specimens are all more or less mutilated, owing to the great fragility of the appendages, and this was also the case with the Greenland specimens examined by Dr. Hansen. It appears somewhat doubtful, whether this form should in reality be referred to the genus *Amphithopsis* of Boeck.

Distribution. Greenland, the Kara Sea.

Fam. **GAMMARIDÆ.**

15. *Gammarus locusta*, Lin.

var. *mutata*, Lilljeb.

Numerous specimens of this form, some of a very large size, were collected in several places along the eastern part of the route of the 'Fram'. It also occurred in 2 samples taken in the western part of the route, on the 4th and 13th February, 1896.

Distribution. Coast of Finmark, Greenland, Iceland, Spitsbergen, Franz Joseph Land, the Kara Sea, Labrador.

16. *Amathilla pingvis* (Krøyer).

A solitary specimen of this form was found in a sample taken on the 21st March, 1894, the tow-net having been lowered to a depth of 300 metres.

Distribution. Greenland, Spitsbergen, the Kara Sea.

ISOPODA.

Tribe: **EPICARIDA.**

Several larvæ of *Epicarida*, chiefly in the last (Cryptoniscian) stage, were found in the samples taken north of the New Siberian Islands. Among them could be determined: 1) larvæ of *Dajus mysidis*, Krøyer, both in first and last stages, 2) the Cryptoniscian larva first described by the Rev. M. Stebbing from the marsupial pouch of an *Onesimus plautus* taken in the Barents Sea, and subsequently found under similar circumstances by the present author off the Norwegian coast, 3) another larva (in the Cryptoniscian stage), closely related to the larva of *Asconiscus simplex*, G. O. Sars.

Digitized by Google

COPEPODA.

Tribe: CALANOIDA.

Division: *AMPHASKANDRIA.*

Fam. CALANIDÆ.[1]

1. *Calanus finmarchicus* (Gunner.).

This well-known and widely-distributed species is also by far the commonest of all the Copepoda in the North Polar Basin explored by the 'Fram' Expedition, forming, indeed, in all the samples, the great bulk of the contents.

Distribution. Throughout the Arctic Ocean, coast of Norway, the Baltic, British Isles, Atlantic coast of Europe, Mediterranean, Black Sea, North Atlantic Ocean, Pacific Ocean.

2. *Calanus hyperboreus,* Kröyer.

This form also occurred in almost all the samples, being easily recognized by its large size, which is more than twice that of *C. finmarchicus.*

Distribution. Throughout the Arctic Ocean, coast of Norway as far south as the Christiania Fjord, but here confined to greater depths.

Fam. SCOLECITHRICIDÆ.

Gen. *Scaphocalanus,* n.

Generic Characters. Cephalic segment coalesced with the 1st pedigerous segment, and in female distinctly carinated dorsally, exhibiting in front an elevated rounded crest, rostral filaments small, but distinct. Last pedigerous segment well defined, though rather small. Tail in female 4-articulate, with the last (anal) segment short, in male 5-articulate, with the 2nd segment large and tumefied. Caudal rami short, with 5 marginal setæ, the innermost but one much longer than the others. Anterior antennæ 23-articulate, the 1st, 2nd and 8th articulations much larger than the others; those in male only 20-articulate and very slender, with large sensory appendages along the proximal part. Posterior antennæ with the outer ramus shorter than the inner, and 6-articulate. Mandibles with the masticatory part rather produced, cutting

[1] The families here recorded answer to the respective sub-families of Dr. Giesbrecht.

Digitized by Google

teeth densely crowded together, and all of the same appearance, bidentate at the tip, palp with the outer ramus exceedingly large. Maxillæ with the masticatory lobe prominent and tipped with slender spines. Anterior maxillipeds comparatively short, with the anterior lobes densely crowded together, terminal sensory appendages very delicate, simple, and of comparatively small size. Posterior maxillipeds slender, with the terminal part reflexed and carrying long, slender setæ. Oral parts in adult male greatly transformed, and, excepting the mandibular palps, much reduced. Natatory legs powerfully developed, inner ramus of 1st pair uniarticulate, of 2nd pair biarticulate, of 3rd and 4th pairs 3-articulate, both rami, except in 1st pair, with irregular transverse rows of spinules behind. Last pair of legs in female very small, 3-articulate, terminal joint fusiform, with 3 spines, the innermost much elongated; those in male very large, with both legs biramous.

Remarks. This new genus is allied to the genus *Scolecithrix* of Brady, and undoubtedly belongs to the sub-family *Scolecithricinæ*, as defined by Dr. Giesbrecht, and here taken in the sense of a true family. It differs, however, from any of the 3 genera hitherto comprised in this family, in the strongly marked cephalic crest, which gives the anterior division of the body a pronouncedly navicular form: hence the generic name here proposed. Moreover, the structure of the last pair of legs in both sexes is somewhat different, and the sexual dimorphism is on the whole more prominent than in any of the other genera. The genus as yet only comprises a single species, which, however, is one of the most characteristic Calanoids of the Polar Sea. It will for this reason be described at some length in the following pages.

3. *Scaphocalanus acrocephalus*, n. sp.
(Pl. VII, VIII, IX).

Specific Characters. — *Female.* Anterior division of body oblong oval, tapering anteriorly, pronouncedly boat-shaped, with the united cephalic and 1st pedigerous segments more than twice as long as the remaining part, cephalic crest projecting considerably in front of the rostral prominence, and narrowly rounded. Last pedigerous segment with the lateral parts obtusely produced behind. Tail about 1/3 as long as the anterior division, with the genital segment shorter than the two succeeding segments combined, and but

Digitized by Google

slightly protuberant below. Caudal rami scarcely twice as long as they are broad, and obliquely rounded at the end, 3 of the marginal setæ issuing from the tip, 2 from the outer edge, middle apical seta almost twice the length of the tail. Anterior antennæ slightly exceeding in length the anterior division of the body, the 8th articulation about the length of the 2nd, last one very small. The 3 posterior pairs of natatory legs with the outer ramus very large, and having the terminal spine coarsely denticulate outside. Last pair of legs with the 2nd joint rather short, but distinctly defined, inner spine of last joint twice as long as the apical one, and minutely denticulate outside. Length of body, exclusive of the caudal setæ, about 5 mm.

Male. Anterior division of body less regularly navicular, being abruptly contracted in front, with the cephalic crest obsolete. Last pedigerous segment very small, with the lateral parts somewhat extant. Tail exceeding half the length of the anterior division, 1st segment quite short, 2nd very large, fully as long as the 2 succeeding ones combined; caudal rami mobile, and, as a rule, spread out to each side, marginal setæ less fully developed than in female. Anterior antennæ comparatively shorter than in female, with the outer half exceedingly slender, proximal part with the joints partly lamellarly expanded, and clothed in front with very large sensory appendages. Posterior antennæ and mandibular palps very powerfully developed; oral parts otherwise very much reduced. Last pair of legs about the length of the natatory legs, and rather complicated in structure, 1st basal joint of both legs coalesced, 2nd basal joint of left leg simple cylindric, that of right leg much shorter, but very broad, rami of both legs slender, styliform, the outer one 3-articulate, the inner uniarticulate. Length of body 4 1/2 mm.

Remarks. The sexual dimorphism of this Calanoid is so very great, that it was only after some time that I could convince myself that the remarkable form figured in Pl. IX is in reality the adult male of that represented in Pl. VII and VIII. At a younger stage, on the other hand, the male resembles the female very closely, and it is accordingly only in the fully adult, or sexually mature state that this remarkable transformation takes place. It would appear from the greatly reduced oral parts, that the existence of such transformed male individuals is restricted to a very short period, and indeed, only a few specimens were found, whereas females and young males occurred very plentifully in the samples examined.

Digitized by Google

Description of the Female.
(Pl. VII, VIII).

The length of fully adult specimens, measured from the front to the end of the caudal rami, amounts to about 5 mm., and this form is accordingly very much larger than any of the previously described species belonging to this family.

The body (see Pl. VII, figs. 1 & 2), as in other Calanoids, has the anterior division very sharply marked off from the posterior, and of much larger size, exhibiting an oblong oval, or more properly navicular form, the greatest width occurring rather behind the middle. This division is composed of 5 segments, the foremost of which is more than twice as long as all the others combined, and more properly represents 2 coalesced segments, the cephalic and 1st pedigerous ones. Anteriorly this segment is gradually narrowed, and is surmounted in front by a very conspicuous median crest, appearing, in a lateral view of the animal (fig. 2), as a narrowly rounded, helmet-shaped expansion, projecting considerably beyond the rostral prominence. The latter is but very slight, and carries at the tip 2 very small tentacular appendages. From this prominence, on each side, a distinctly marked, somewhat flexuous line is seen extending obliquely back as far as the base of the posterior maxillipeds, where it abruptly curves straight backwards. As far as these lines are oblique, they constitute the inferior edges of the cephalic part of the segment, and below them the soft ventral face is somewhat protuberant, exhibiting, about in the middle, the oral aperture, and on each side the antennæ and the several oral appendages. The remaining part of the segment is somewhat shorter than the cephalic part, but still nearly as long as all the exposed pedigerous segments combined. Of these the 3 anterior slightly diminish in size, whereas the last is very small and imperfectly defined from the preceding one. In the middle, this latter segment is deeply emarginated, the lateral parts projecting behind as obtuse protuberances.

The posterior division of the body, or the tail, is scarcely more than 1/3 the length of the anterior, and is very much narrower, subcylindric in form. It is composed (see fig. 9) of 4 well-defined segments, the 1st of which, or the genital segment, is much the largest, though shorter than the 2 succeeding ones combined. It is somewhat dilated in front, and forms below a slight protuberance, carrying the genital opening. Of the succeeding segments, the

Digitized by Google

penultimate one is but little smaller than the preceding segment, whereas the last, or anal segment is very short. The caudal rami, or furca, are likewise rather short, being scarcely twice as long as they are broad. They are finely ciliated inside, and obliquely rounded at the end, each carrying 5 densely plumous setæ. Of these the 2 outer are attached to distinct ledges outside the tip, whereas the remaining 3 orginate from the tip itself. The middle apical seta, or the innermost but one, is much longer than the others, and may attain to twice the length of the tail. As, however, these setæ are very brittle, it is rather unusual to find specimens in which they are quite perfect. In addition to the above-mentioned caudal setæ, a very delicate unciliated bristle is found, as usual, on each of the rami, originating from the inner corner, and lying above the others.

No trace of eye could be detected in the alcoholic specimens; but it is very probable that in reality it is present in the fresh state of the animal, though of very simple structure, and easily destructible by the action of the alcohol.

The anterior antennæ (see figs. 1 & 2) slightly exceed in length the anterior division of the body, and are rather slender, gradually tapering somewhat distally. They are composed (see Pl. VIII, fig. 1) of 23 articulations, carrying in front scattered bristles of somewhat unequal length. As the normal number of articulations in the Calanoids is 25, a fusion of some of the articulations may be supposed to have taken place. It will also be found, that 2 of the articulations, viz., the 2nd and the 8th, are of unusual size and may both originally have represented 2 articulations. This being admitted, the full number of articulations is made up. The penultimate articulation is somewhat longer than the next preceding ones, and carries at the end, both in front and behind, a rather strong seta. The last articulation is extremely small, and is connected with the former along an oblique suture. It is provided at the tip with a fascicle of comparatively short bristles.

The posterior antennæ (fig. 2) are, as usual, each composed of a short biarticulate basal part, and 2 differently formed rami. The distal joint of the basal part is considerably larger than the proximal one, and carries at the end anteriorly, 2 slender ciliated setæ. The inner ramus is composed of 2 joints, the 1st long and narrow, linear in form, and carrying. at some distance from the tip anteriorly, a single slender seta, the 2nd short, slightly bilobular

Digitized by Google

at the tip, and carrying about 14 long setæ arranged in a flabelliform manner. The outer ramus, which is very mobile, is somewhat shorter than the inner, and is cylindric in form. It is composed of 6 joints, the 2nd and last of which are the largest, the 3 joints lying between them being very short. This ramus carries 3 exceedingly long and finely plumose apical setæ, and 4 lateral ones of the same structure, the outermost of which, however, is rather short.

The oral aperture (see Pl. VII, fig. 3) is bounded in front by a rather voluminous, flap-shaped anterior lip, and behind by a much smaller bilobular posterior lip, both being to some extent finely ciliated on the edges turned towards the mouth.

The mandibles (see Pl. VIII, figs. 3, 4) have the masticatory part rather produced, but only slightly expanded distally, with the cutting teeth densely crowded together, and bidentate at the tip, the outer one not, as is usually the case, differing from the others. The palp is very fully developed, being rather larger than the body of the mandible, and, like the posterior antennæ, is composed of a biarticulate basal part, and 3 unequal rami. The 1st basal joint is very small and easily overlooked, whereas the 2nd is large and broad, slightly widening distally, and provided inside with a single small bristle. The inner ramus is very short and composed of 2 joints of about equal size, the last carrying at the tip about 8 slender setæ spread in a fan-like manner. The outer ramus is very greatly developed, being more than twice as long as the inner, and rather thick, fusiform in shape. It is divided into 5 well defined joints, the last of which, however, is so very small, as easily to escape attention. This ramus carries 6 extremely strong and elongated plumose setæ, 2 issuing from the last joint, and a single one from each of the preceding joints. The setæ gradually increase in length proximally, that issuing from the 1st joint being from 8 to 10 times as long as the ramus itself.

The maxillæ (fig. 5) have the masticatory lobe narrowly produced, and clothed with unusually slender spines. The opposite vibratory plate carries 8 plumose setæ, the outermost of which is shorter than the others. The remaining part of the maxilla is very delicate, membranous, and divided into 4 setiferous lobes, the 2 terminal ones more properly answering to the 2 rami in the posterior antennæ and mandibular palp. Of these 2 lobes, only the outer one is distinctly defined at the base, forming an oval, mobile lamella, edged with 7 curved setæ.

Digitized by Google

The anterior maxillipeds (fig. 6) are comparatively small, and apparently each composed of 6 joints, the 1st of which is more than twice as large as all the others combined. Anteriorly, these maxillipeds exhibit 5 digitiform lobes, closely crowded together, and tipped with long, coarsely ciliated, and partly spiniform setæ. The setæ issuing from the 2 outer, extremely small joints are transformed, as in the other forms belonging to this family, into very delicate sensory appendages. In the present form, these appendages are 5 in number, and of inconsiderable size and simple structure.

The posterior maxillipeds (fig. 7) form each a slender, doubly geniculate stem composed of 7 joints, the first 2 of which are much larger than the others, and together constitute the basal part. The 1st basal joint is somewhat lamellarly expanded, and carries anteriorly 6 ciliated setæ. The 2nd basal joint is about the same length as the 1st, but much narrower, and forms with it an elbow-shaped bend. It carries posteriorly 3 ciliated setæ, and at the end 2 similar setæ placed close together. The 5 succeeding joints constitute together the terminal part, which is very flexible and, as a rule, recurved. It is clothed posteriorly with numerous very slender setæ, increasing in length distally, the outermost almost equalling the whole maxilliped in length.

The natatory legs are powerfully developed, though the 1st pair, as usual, are considerably smaller than the 3 succeeding ones. In all of them, the inner ramus is much smaller than the outer, which is 3-articulate and in the 3 posterior pairs very large, with the joints lamellarly expanded.

The 1st pair of legs (Pl. VII, fig. 4) are not only much smaller than the others, but also of rather different structure. The 1st basal joint does not exhibit any trace of the strong plumose seta found on the inner side of all the other pairs. On the other hand, inside the end of the 2nd basal joint, there is a slender, flexuous seta, not found in the other pairs. The outer ramus is scarcely longer than the basal part, and has the 1st joint quite simple, without any spine or setæ. The 2nd joint, on the other hand, has outside at the end a very small spine, and inside a natatory seta. The last joint is but little larger than the 2nd, and is somewhat curved outwards. It carries inside 4 natatory setæ, and at the tip a comparatively small spine; its outer edge on the other hand, is without spines, exhibiting only a fine ciliation. The inner ramus is scarcely half as long as the outer, and consists of only a single joint, though an abrupt instriction of the outer edge seems to indicate

Digitized by Google

an attempt at a subdivision. It carries 5 natatory setæ, 2 of which issue from the tip, the other 3 from the inner edge.

The 2nd pair of legs (fig. 5) are much larger than the 1st, and have the outer ramus nearly twice as long as the basal part. The 1st joint of this ramus, however, is comparatively small, and is much constricted at the base, carrying outside a well developed spine, and inside a natatory seta. The 2nd joint is large and expanded, and likewise provided outside with a strong spine, inside with a natatory seta. The last joint is still larger, being fully as long as the other 2 combined, and it carries outside 3 strong spines attached to distinct ledges on the margin, inside, 4 natatory setæ, and at the tip an exceedingly strong, mucroniform spine, coarsely denticulate outside. The inner ramus is scarcely more than half as long as the outer, and is composed of 2 well defined joints, the 1st rather small, and carrying inside a single natatory seta, the last oblong fusiform, and provided with 5 natatory setæ, 2 of which issue from the tip, 2 from the inner edge, and one from the outer.

The 2 succeeding pairs of legs (Pl. VII, fig. 6, Pl. VIII, fig. 8) resemble in structure the 2nd pair, but are still larger, and have the inner ramus distinctly 3-articulate, with one natatory seta more than in that pair. The terminal joint of the outer ramus is, moreover, somewhat larger, considerably exceeding in length the other 2 combined. In all the pairs except the 1st, several transverse rows of small spinules are observed on the hind face of the rami. These spinules are especially conspicuous on the inner ramus, where they are arranged in 3 or 4 oblique rows.

The 5th pair of legs (Pl. VII, fig. 7) are very small and simple in structure, somewhat resembling those in the genus *Scolecithrix*. They are, however, less rudimentary, each leg being composed of 3 distinct joints, whereas in the above-named genus, these legs are biarticulate, or altogether wanting. The basal joints of both legs are united in the middle, constituting a common broad basal part. The 2nd joint is rather small, but well defined from both the basal and terminal joints. The last joint is oblong fusiform in shape, and carries 3 unequal spines, one apical and 2 lateral. Of the latter, that issuing from the inner edge is very much elongated and extended obliquely inwards, so as to meet the corresponding spine of the other leg. It is finely denticulate outside, whereas the other spines are quite smooth, that of the outer edge being also very small.

Digitized by Google

In young, not yet sexually mature males, this pair of legs (fig. 8) are likewise very small, but rather different in structure from those in the female, and more resembling in this respect the natatory legs. As in the latter, each leg is composed of a distinctly biarticulate basal part and 2 unequal rami, the inner uniarticulate, the outer biarticulate. The rami do not, however, carry any natatory setæ, and there are also only very slight traces of spines to be detected. Both legs exhibit a soft cellular structure, and are still only very slightly chitinized, indicating that they are as yet imperfectly developed, and there is but little difference between them, whereas in the sexually mature state, as will be shown below, these legs are very unequal.

Description of the Sexually Mature Male.
(Pl. IX).

The length of the body does not, in any of the specimens found, exceed 4½ mm.

The general form (see figs. 1 & 2) is very different in appearance from that of the female, both as regards the anterior and posterior divisions.

The former is less pronouncedly navicular in form, on account of the absence of the cephalic crest. Seen dorsally (fig. 1), it is abruptly contracted anteriorly, with the front obtusely truncated, not, as in the female, sharply pointed (comp. Pl. VII, fig. 1); and posteriorly it is but very slightly narrowed. The last segment is extremely small, and more broadly emarginated than in the female, with the lateral parts much less produced behind.

The tail is comparatively larger than in the female, considerably exceeding half the length of the anterior division, and is composed of 5 well defined segments. Of these the 1st is very small and greatly constricted at the base, whereas the 2nd segment is of unusually large size and considerably tumefied, equalling in length the 2 succeeding ones combined. The last, or anal segment, as in the female, is very short. The caudal rami, which in the female are quite immobile, have here a very mobile articulation with the last segment, allowing of their being considerably spread out to each side (see fig. 1). The caudal setæ, too, are less fully developed than in the female, though apparently present in the same number; and in all the specimens examined, they were widely divergent.

Digitized by Google

The superior antennæ (fig. 4) are comparatively somewhat shorter than in the female, scarcely exceeding in length the anterior division of the body; and they are composed of only 20 articulations. The two antennæ are exactly alike, both having the proximal half clothed in front with strongly developed sensory appendages, in addition to the bristles. Some of the joints of this part, moreover, have assumed a lamellar appearance, especially the third one; and the 8th joint is still more elongated than in the female, and is apparently constituted of 3 coalesced joints. The distal half of the antennæ is very narrow and, as a rule, forms with the proximal half a slight, angular curve.

The posterior antennæ are of the same structure as in the female, but are comparatively more powerfully developed.

The oral parts, on the other hand, are rather unlike those in the female, being in some respects much reduced.

The mandibles (fig. 5) have the masticatory part very poorly developed, whereas the body itself is comparatively larger and broader than in the female. This is also the case with the palp, which is much more robust than in the female, with the basal part very broad and muscular.

The maxillæ (fig. 6), though exhibiting a structure similar to that in the female, are rather smaller, and have both the masticatory lobe and the vibratory plate less fully developed.

The anterior maxillipeds (fig. 7) are extremely small and rudimentary, only with great difficulty permitting of any close examination.

The posterior maxillipeds (fig. 8) are likewise much feebler in structure than in the female, and have some of the outer setæ recurved and densely plumous.

The natatory legs (figs. 9, 10), on the other hand, agree exactly, both in size and structure, with those in the female.

The last pair of legs (fig. 11), as is usual in male Calanoida, are peculiarly transformed and prehensile in character. They are rather large, scarcely smaller than the natatory legs, and the development of the 2 legs is very unequal, though both exhibit the same chief parts, viz, a biarticulate basal part, and 2 styliform rami, the outer of which is 3-articulate, the inner uniarticulate. The 1st basal joints of the 2 legs are partly coalesced, and the 2nd is very different in the 2 legs. In the right leg it is simple cylindric, and projects far beyond that of the left leg. The 2 rami of this leg are

Digitized by Google

of about equal length, both issuing close together from the end of the basal part, and curving inwards. The 3 joints of the outer ramus gradually diminish in size, the last being rather small and lamelliform, with several small spines inside, and 2 somewhat longer setæ at the tip. The inner ramus terminates in a hook-shaped point. In the left leg, the 2nd basal joint is quite short and of irregular form, encompassing the end of the 1st basal joint of the right leg. The 2 rami are of very unequal length, and issue far apart, the outer one being twice as long as the inner, and having the 1st joint longer than the other 2 combined. This joint originates with a broad base, but rapidly contracts, and projects at the end inside to a small linguiform lobe, its 2 outer joints being very narrow and quite smooth. The inner ramus is simple styliform, terminating in an acute point.

The musculature of the body is much stronger than in the female, and the movements of the animal must therefore be assumed to have been rather more powerful. The muscles converging from the dorsal face to the posterior antennæ and mandibular palps are especially conspicuous, exhibiting a peculiar opalescent lustre; and the muscles acting upon the tail are also unusually strong.

Occurrence. It is very strange that this large and conspicuous Calanoid has hitherto quite escaped the attention of zoologists, though it seems to be one of the commonest forms of the Polar Sea. Indeed, it occurred rather plentifully in the greater number (15) of the samples taken during the 'Fram' Expedition. It was collected both at the surface, and down to 300 metres, and seems to be as common in the western, as in the eastern part of the basin traversed. Young males occurred in almost the same number as females; but of fully adult, sexually mature males only a very limited number of specimens was found.

Gen. *Scolecithrix*, Brady.

Remarks. This genus was established in the year 1883 by Prof. Brady, to include the form previously described by Lubbock as *Undina Danæ;* at the same time he adds another species, *S. minor*, which, like the former, was procured during the Challenger Expedition, and which also occasionally occurs off the coast of Norway. Dr. Giesbrecht, too, enumerates no less than

Digitized by Google

12 additional species, some from the Mediterranean, some from the tropical parts of the Atlantic and Pacific Oceans. It is, however, rather questionable, if all these species are in reality congeneric. The chief character upon which Brady founded this genus, is the peculiar transformation of the apical setæ of the anterior maxillipeds into delicate, vermiform, sensory appendages; but as shown by Dr. Giesbrecht, this character is also found in some other genera *(Xanthocalanus, Phaënna)*, comprised by him in his subfamily *Scolecithricinæ;* and in the polar genus *Scaphocalanus*, described above, this character is also rather obvious. At any rate, the *Undina Danæ* of Lubbock ought to be regarded as the type of the genus *Scolecithrix*, and, indeed, this form is found to differ in some points very essentially from the other species. Thus, the 5th pair of legs are quite wanting in the female of this species, and the structure of the anterior antennæ and the tail is also rather different. Perhaps therefore the genus *Scolecithrix* should more properly be restricted to this form, and the other species be referred to one or two nearly-allied genera.

In the samples taken during the Nansen Expedition, I have found some few specimens of a form which must certainly be referred to this genus in the sense in which Dr. Giesbrecht takes it, but which differs very materially from the type species.

4. *Scolecithrix brevicornis* n. sp.

(Pl. X).

Specific Characters. ♀ Anterior division of body regularly oblong oval in form, front evenly rounded and less deep than in the other species; last segment imperfectly defined from the penultimate one, and having the lateral parts obtusely produced behind. Tail scarcely more than 1/3 as long as the anterior division, and rather narrow, caudal rami about twice as long as they are broad. Anterior antennæ comparatively short, not nearly attaining the length of the anterior division of the body, and composed of 22 articulations, 2nd and 8th larger than the others, the last two united. Posterior antennæ with the rami subequal in length. Anterior maxillipeds with 5 very large and curved sensory appendages at the tip. Posterior maxillipeds with the terminal part recurved. Last pair of legs very small, but distinct, biarticulate, distal joint fusiform, with 3 unequal spines, one apical, one very small out-

Digitized by Google

side, and one rather large, and finely denticulated spine inside. Length of adult female scarcely exceeding 2 mm.

Remarks. As stated above, this form is very different from the type species, *S. Danæ*, Lubb., and more closely resembles the 2nd species recorded by Brady, *S. minor;* but also from this species, it may easily be distinguished by the comparatively shorter anterior antennæ, and the more regularly rounded frontal part. It is somewhat more difficult to point out the distinguishing characters in relation to the other species established by Dr. Giesbrecht. I believe, however, that the polar form is specifically distinct from any of them.

Description of the Female.

The length of fully adult specimens does not exceed 2 mm.

The general form of the body (see figs. 1 & 2) is rather short and thick, as is also the case with the other species referred to this genus. The anterior division, when seen dorsally (fig. 1), is rather regularly oblong oval in form, with the greatest width behind the middle, and somewhat exceeding 1/3 of the length. It gradually tapers both in front and behind, the anterior extremity being evenly rounded, the posterior deeply incised in the middle. The cephalic segment is quite coalesced with the 1st pedigerous one, both together forming a very large segment, fully twice as long as all the others combined. Seen laterally (fig. 2), this segment appears narrowly rounded in front, whereas in *S. minor* it is almost transversally truncated. The rostral projection (see also fig. 3) is well marked, and carries 2 slender tentacular filaments. The last segment is imperfectly defined from the penultimate one, and has its lateral parts obtusely produced behind on each side of the deep median emargination (see fig. 1).

The tail is rather small, scarcely exceeding in length 1/3 of the anterior division, and it is narrow cylindric in form. Of the 4 segments composing it, the 1st, or genital segment is, as usual, the largest, though shorter than the 2 succeeding ones combined. The last segment is somewhat smaller than the penultimate one. The caudal rami are about twice as long as they are broad, and not at all divergent. The caudal setæ in all the specimens found were broken off, and their relative length cannot therefore be indicated.

The anterior antennæ (fig. 4) are comparatively short, not nearly attaining the length of the anterior division of the body, and they are composed of only

Digitized by Google

22 articulations. Of these, as in the preceding form, the 2nd and 8th are considerably larger than the others, and each apparently represents 2 coalesced articulations. This seems also to be the case with the last joint, which is rather longer than the next preceding ones. The antenna carries anteriorly short bristles of nearly uniform length.

The posterior antennæ (fig. 5) resemble in structure those in the preceding form, and, like them, have the outer ramus a little shorter than the inner.

The mandibles and maxillæ (see figs. 6, 7) are likewise of a structure very similar to that in *Scaphocalanus*.

The anterior maxillipeds (fig. 8), on the other hand, are distinguished by the large size of the 5 apical sensory appendages, which are somewhat fusiform in shape, and strongly incurved, so as to cross the spines issuing from the anterior lobes.

The posterior maxillipeds (fig. 9) are rather feeble in structure, and, as in the preceding form, have the terminal part recurved, and clothed with long, slender setæ.

The natatory legs (figs. 10—13), on the whole, agree in their structure very closely with those in *Scaphocalanus;* and, as in that form, the rami of the 3 posterior pairs are provided on their posterior face with irregular transverse rows of small spinules.

The last pair of legs (fig. 14) are very small, and still less fully developed than in *Scaphocalanus,* each leg being composed of only 2 joints, the 1st representing the basal part, the 2nd the outer ramus. The latter is much the larger, and is fusiform in outline, carrying 3 unequal spines, one apical and 2 lateral. Of the latter, the inner one is much the largest, and rather elongated, being obliquely incurved and finely spinulous on the edge.

Occurrence. Some few female specimens of this form were found in a sample taken on the 22nd May, 1894, north of the 81st degree of latitude, the tow-net having been lowered to 100 metres.

Gen. *Xanthocalanus*, Giesbr.

Remarks. This genus, established by Dr. Giesbrecht, is chiefly characterised from *Scolecithrix* by a somewhat different structure of the anterior maxillipeds, and of the last pair of legs in both sexes. Moreover, the relative length of the rami in the posterior antennæ, and the mandibular palps, is

Digitized by Google

somewhat different. Dr. Giesbrecht records 2 species of this genus, both from the Mediterranean, and I have myself found another species off the Norwegian coast. From the Nansen Expedition a single, somewhat defective female specimen of the latter species is derived, to be described below.

5. *Xanthocalanus borealis*, n. sp.
(Pl. XI).

Specific Characters. ♀. Anterior division of body rather tumid and greatly vaulted above, regularly oval in form, greatest width almost attaining half the length, front narrowly rounded, last segment imperfectly defined, with the lateral parts angularly produced behind. Tail scarcely attaining 1/3 of the length of the anterior division, genital segment about the length of the 2 succeeding segments combined, last segment very small, caudal rami short, slightly divergent. Anterior antennæ exceeding in length the anterior division of the body, and 24-articulate. Posterior antennæ with the outer ramus considerably longer than the inner. Anterior maxillipeds with the outermost spine very strong and coarsely denticulate, apical sensory appendages comparatively small, 8 in number. Posterior maxillipeds with the terminal part comparatively short, and not recurved. Last pair of legs biarticulate, distal joint constricted in the middle, and carrying at the tip 3 strong, denticulated spines of about equal size. Length of adult female 4 mm.

Remarks. This form differs at once from the 2 Mediterranean species described by Dr. Giesbrecht, in its much larger size and more robust form of body. In the structure of the last pair of legs, it more resembles the smaller species, *X. minor*, than the larger *X. agilis*, the length of which according to Dr. Giesbrecht, is only 2·40 mm.

Description of the Female.

The length of the one specimen in the collection, which is an adult female, is 4 mm., or nearly twice that of the larger Mediterranean species.

The general form of the body (see figs. 1 & 2) is rather robust, with the anterior division considerably tumefied, and greatly vaulted dorsally. Seen from above (fig. 1), this division exhibits a rather regular oval form, with the

Digitized by Google

greatest width about in the middle, and almost equalling half the length. It gradually tapers both in front and behind, the anterior extremity being narrowly rounded, the posterior deeply emarginated in the middle. The front terminates below in a rather slight rostral projection, carrying 2 very small tentacular filaments. The cephalic segment is defined behind from the 1st pedigerous segment by a faint transversal suture. The last segment, on the other hand, is completely coalesced with the penultimate one, and has the lateral parts considerably produced behind, terminating in an acute corner.

The tail (see also fig. 14) is scarcely 1/3 as long as the anterior division, and is cylindric in form. It is, as usual, composed of 4 segments, the 1st, or genital segment, being much the largest, and equalling in length the 2 succeeding ones combined. The last, or anal segment is extremely small. The caudal rami are comparatively short, being scarcely longer than they are broad, and are somewhat divergent. All the setæ were broken off in the specimen examined.

The anterior antennæ are rather slender, and somewhat exceed in length the anterior division of the body. They are composed of 24 articulations, the 8th of which is somewhat longer than the next adjacent ones. In the specimen examined, the distal part of both antennæ was, however, broken off.

The posterior antennæ (fig. 3) have the outer ramus considerably longer than the inner, and composed of 6 articulations, the 2nd and last of which are the largest, the 3 intermediate articulations being very short. All the joints, except the 1st, carry long ciliated setæ.

The mandibles (fig. 4) have the masticatory part but slightly expanded, with the cutting teeth closely crowded together and rather simple in structure. The palp is scarcely as large as the body of the mandible, and has the outer ramus much smaller than in the 2 preceding forms, and scarcely larger than the inner. The basal part carries 3 setæ inside.

The maxillæ (fig. 5) are quite normal in structure, with the masticatory lobe less prominent than in the 2 preceding forms, and armed with about 12 partly denticulated spines. The vibratory plate carries 9 plumose setæ, the 2 proximal ones, however, being rather short. The outer, membranous part of the maxilla, or the palp, exhibits the usual setiferous lappets, the

Digitized by Google

outermost being rather small, not extending beyond the middle of the adjacent lappet.

The anterior maxillipeds (fig. 6) are short and thick, with the 5 digitiform lobes of the anterior edge densely crowded together, and clothed with strong, coarsely ciliated setæ. On each of the 2 outermost lobes one of these setæ assumes the character of a claw-like spine. The outermost spine in particular, is very strong and coarsely denticulate laterally. The apical sensory appendages are 8 in number, and comparatively small. According to Dr. Giesbrecht, they terminate, in the species of this genus, in extremely delicate brushes, which I, however, have failed to detect in the form here in question.

The posterior maxillipeds (fig. 7) are rather slender, being almost 3 times as long as the anterior. The terminal part, however, is comparatively short, scarcely more than half as long as the 2nd basal joint, and is not reflexed. The setæ clothing this part are also rather shorter than in the 2 preceding forms, and are coarsely ciliated in their proximal part.

The natatory legs (figs. 8—11) are built upon the very same type as in the 2 preceding forms. In the 1st pair (fig. 8), however, outside the 1st joint of the outer ramus, there is a well-marked spine that is wanting in these forms.

The last pair of legs (figs. 12, 13) exhibit a rather characteristic appearance. They are each composed of only 2 joints, the 1st of which is rather short and coarsely hairy inside. The distal joint is about twice as large, oblong in form, and exhibits in the middle a conspicuous constriction. It is likewise clothed with delicate hairs both inside and outside, and carries at the end 3 strong, denticulated spines of nearly equal length, the middle one being attached to a projecting knob of the joint.

Occurrence. The above-described specimen was found in a sample taken on the 13th October, 1893, north of the New Siberian Islands, the tow-net having been lowered to a depth of 50 metres.

Distribution. Coast of Norway, rather abundant in the greater depths of the fjords, below 150 fathoms.

Gen. *Undinella*, n.

Generic Characters. Cephalic segment not coalesced with the 1st pedigerous one, front produced below to a well-marked rostral prominence

Digitized by Google

carrying 2 small tentacular filaments. Last pedigerous segment wholly coalesced with the penultimate one, and, in female, having the lateral parts lamellarly produced. Tail slender and elongated, composed in female of 4, in male of 5 segments, the last in both sexes extremely small. Caudal rami lamellar, with 4 apical setæ. Anterior antennæ in female 24-articulate, in male more slender, and clothed in their proximal part with well-developed sensory appendages. Posterior antennæ with the outer ramus much longer than the inner. Mandibles slender, with the 2 outer cutting teeth strong, bidentate at the tip, the others setiform; palp with the outer ramus comparatively small. Maxillæ with the masticatory lobe very large; vibratory lamella, on the other hand, poorly developed. Anterior maxillipeds rather strong, anterior lobes densely crowded together, and carrying comparatively short setæ, the outermost of which are claw-like, apical appendages scarcely transformed. Posterior maxillipeds exceedingly slender, with the terminal part reflexed and only sparingly setiferous. Oral parts in male not transformed. Natatory legs powerfully developed, posterior face smooth, inner ramus of the 2 anterior pairs uniarticulate, of the 2 posterior biarticulate. Last pair of legs in female 3-articulate, terminal joint slender, sub-spatulate, terminating in a number of short digitiform spines; those in male exceedingly large and complex in structure, with both legs largely developed, the left one with a long, styliform inner ramus.

Remarks. This new genus is only provisionally placed within the family *Scolecithricidæ*. It differs, indeed, in the character upon which this family has chiefly been founded, the apical setæ of the anterior maxillipeds being scarcely transformed at all; but in other characters it seems to approach nearer to the forms included in this family than to those of other Calanoid families. The genus comprises as yet only a single species, to be described below.

6. *Undinella oblonga*, n. sp.
(Pl. XII, XIII).

Specific Characters. Form of body rather slender, especially in the male. Anterior division regularly oblong oval in form, obtusely rounded in front, deeply emarginated behind. Cephalic segment defined behind by a distinct transversal suture, rostral prominence very conspicuous, pointing

Digitized by Google

straight downwards, tip minutely incised in the middle. Lateral parts of last segment produced in female to triangular, posteriorly-pointing lobes. Tail fully half the length of the anterior division of the body, genital segment in female considerably dilated in the middle. Caudal rami slightly widening distally, apical setæ not much elongated, and scarcely different in size. Anterior antennæ slightly exceeding in length the anterior division of the body, 8th articulation larger than the adjacent ones, and in male much elongated, apparently constituting 3 united articulations. Last pair of legs in female with the terminal joint twice as long as the middle one, and very narrow at the base, slightly widening distally, and carrying at the end 4 comparatively short denticulated spines, only the outermost of which is distinctly defined at the base; those in male much larger than the natatory legs, right leg the longest, without any inner ramus, outer ramus biarticulate, with the proximal joint bow-shaped, distal joint oblong lamellar, and bent upon the former; left leg with the outer ramus much shorter than the inner, and 3-articulate, last joint very small, setous at the tip, penultimate one produced at the end inside to a rounded denticulated lamella. Length of female about 3 mm., of male 2·50 mm.

Remarks. This is a very distinct and easily recognizable form, exhibiting in its external appearance, in the comparatively slender form and elongated tail, some resemblance to the *Cyclopoida*. In the anatomical structure of the several appendages it shows itself, however, to be a true *Calanoid*.

Description of the Female.

The length of the largest specimens amounts to about 3 mm., and this form is accordingly of medium size.

The general form of the body (see figs. 1 & 2) is rather slender, and the relative length of the 2 chief divisions is somewhat unlike that generally met with in the *Calanoida*. The anterior division is moderately vaulted above (see fig. 2) and, seen dorsally (fig. 1), is of a very regular oblong oval form, with the greatest width somewhat in front of the middle and considerably less than half the length. The anterior extremity, in this view of the animal, appears narrowly rounded, the posterior deeply emarginated in the middle. In a lateral view of the animal (fig. 2) the frontal part appears more evenly rounded, terminating below in a very conspicuous deflexed rostral

Digitized by Google

prominence. On a closer examination, this prominence (see figs. 4, 5) is found to be minutely incised at the tip, terminating in 2 short points, each carrying outside a slender tentacular filament. The cephalic segment is well defined from the 1st pedigerous one, a distinct suture being observable between them. On the other hand, no such line of demarcation is to be detected between the 2 last segments, which accordingly are completely coalesced into a single segment. The lateral parts of this segment are produced behind in the form of rather large triangular lobes projecting on each side of the base of the tail. The latter division is fully half as long as the anterior, and rather slender. It is, as usual, composed of 4 segments; but the last of these, the anal segment, is so very small, that it may easily escape attention. The 1st, or genital segment is somewhat larger than the succeeding one, and is considerably dilated in the middle, exhibiting below, moreover, a broadly rounded protuberance.

The caudal rami (see fig. 10) are pronouncedly lamellar, more than twice as long as they are broad, and gradually somewhat widening distally. They each carry 4 densely plumose setæ, 3 of which issue from the obtusely rounded tip, the 4th somewhat more externally from a distinct ledge of the outer edge. The setæ are not of any considerable length, being scarcely more than half as long as the tail. The outermost seta is a little shorter than the other 3, which are equal in length. As in most other Calanoids, moreover, a very delicate, unciliated bristle is seen orginating from the dorsal face of each ramus, near the inner corner, being angularly bent, with the distal part extending outwards across the caudal setæ.

Of any eye, no trace could be detected, though most probably it has been present in the fresh state of the animal.

The anterior antennæ (fig. 6) are rather slender and attenuated, somewhat exceeding the length of the anterior division of the body. They are composed of 24 well-defined articulations, of which, as in the 3 preceding forms, the first 2 and the 8th are the largest. The joints are clothed anteriorly with short bristles, more densely crowded together in the proximal part of the antenna.

The posterior antennæ (Pl. XIII, fig. 1) have the outer ramus very fully developed, and considerably longer than the inner, its structure being about the same as in the 3 preceding forms.

Digitized by Google

The anterior and posterior lips (Pl. XII, figs. 8, 9) are of quite normal structure.

The mandibles (Pl. XIII, fig. 2) have the masticatory part rather produced, though only slightly expanded. Of the cutting teeth, the outer 2 are well developed and bidentate at the tip, whereas the others are very feeble, setiform. The palp is shorter than the body of the mandible, and has the basal part obliquely produced at the inner corner, so that the inner ramus projects considerably beyond the outer, which is rather small.

The maxillæ (fig. 3) are distinguished by the strong development of the masticatory lobe, which is unusually broad, and armed with about 12 strong, denticulated spines. The vibratory plate, on the other hand, is poorly developed, and provided with only 6 comparatively small setæ. On the terminal part, or palp, the outermost lobe is likewise poorly developed, with only 2 apical setæ.

The anterior maxillipeds (fig. 4) are of moderate size, with the basal joint more than twice as large as the others combined. The digitiform lobes of the anterior edge are densely crowded together, and carry comparatively short setæ, the outermost of which assume a claw-like structure. The apical setæ issuing from the 2 outermost, very small joints, are short and simple, being scarcely sensory in character.

The posterior maxillipeds (fig. 5) are extremely slender and elongated, with the 2nd basal joint very narrow and almost naked, forming with the 1st a more or less abrupt, elbow-shaped bend. The terminal part is very slender, almost as long as the 2nd basal joint, and is reflexed and provided with only a very restricted number of setæ.

The natatory legs (figs. 6—9) are powerfully developed, and on the whole built upon the same type as in the 3 preceding forms, though no trace is found of the small spinules clothing the posterior face of the rami in these forms. The inner ramus, however, in the 2nd pair (fig. 7), is uniarticulate, like that in the 1st pair, and in the 2 posterior pairs it is only biarticulate; but in all these pairs, on a closer examination, a slight indication of the formation of a short 1st joint may be observed. In the 3 posterior pairs, the outer ramus is very broad, with the apical spine strongly developed, and bordered outside with a hyaline, serrated rim.

Digitized by Google

The last pair of legs (fig. 10) consist each of a distinctly 3-articulate stem, the 1st joint of which is united with that of the other side to a common basal part. The 2nd joint is much narrower and, like the 1st, quite smooth. The 3rd joint is considerably longer, but very narrow in its proximal part, slightly expanding towards the end, so as to assume a narrow spatulate form. It terminates in 4 short digitiform processes finely denticulated at the edges. Of these, the outermost is distinctly defined at the base, whereas the other 3 form immediate prolongations of the joint.

Description of the Adult Male.

The length of the body scarcely exceeds 2·50 mm., and the male is accordingly somewhat inferior in size to the female.

The sexual differences are very conspicuous, though not developed to nearly such a degree as in the male of *Scaphocalanus;* and it is, indeed, in this instance, not difficult to recognize the specific relation of the male individuals.

The form of the body (see Pl. XII, fig 3) is, on the whole, still more slender than in the female, and the relative proportions of the 2 chief divisions are somewhat different, the tail being exceedingly slender, and considerably more than half as long as the anterior division. The latter is of a regular oblong oval form similar to that in the female, though somewhat narrower, and has the lateral corners of the last segment much shorter. The tail is narrow cylindric in form, and is divided into 5 segments, the 1st of which is quite short, and greatly constricted at the base. The last segment, as in the female, is very short, and the caudal rami with their setæ do not exhibit any perceptible difference from those in the female.

The anterior antennæ (fig. 7) are comparatively somewhat more slender than in the female, and, when reflexed, project far beyond the limits of the anterior division, extending to about the middle of the tail. The 2 antennæ are exactly alike, and both are found to have one articulation less than in the female, on account of the 9th being coalesced with the 8th. In addition to the usual bristles, the antennæ carry a number of rather fully developed sensory filaments, which are especially thickly set in the proximal part of the antenna.

The posterior antennæ, oral parts, and natatory legs do not exhibit in their structure any appreciable difference from those organs in the female.

Digitized by Google

The last pair of legs, on the other hand, are very different and quite enormously developed, being much larger than the natatory legs, and about equalling in length 1/8 of the whole body. The 2 legs (see Pl. XIII, fig. 11), as usual, are rather differently developed, both being, however, of a rather complex structure, and strongly muscular. The 1st basal joints of the two legs are wholly coalesced, forming a common, somewhat lamellar stalk. The 2nd basal joint is rather tumid, and in the right leg considerably larger than in the left. The terminal part of the former, representing the outer ramus, is very much elongated, and of a rather irregular shape, consisting of 2 highly chitinized pieces, movably articulated together. The proximal piece is much the larger, and is curved outwards like a bow. It is very narrow, though expanding somewhat in its distal part, and projecting at some distance from the tip, inside, to a short, heel-shaped prominence. The distal piece has the form of a narrow oblong lamella, bent in the opposite direction, and gradually widening somewhat towards the tip, which is obtusely rounded. Of any inner ramus, no trace is found in this leg. In the left leg, on the other hand, the inner ramus is very fully developed, forming a long styliform process, nearly twice as long as the outer ramus, and extending to the end of the right leg. It is likewise highly chitinized and gently curved, exhibiting at some distance from the tip a very slight dilatation. The outer ramus of this leg is composed of 3 joints, of which the first 2 form together a somewhat fusiform division bent inwards at the tip in a hook-like manner, and terminating in a rounded lamella, finely denticulated at the edge. The terminal joint, issuing outside this lamella, is very small, conical in form, and tipped with a fascicle of small bristles.

Occurrence. This peculiar Calanoid occurred in 5 of the samples, in none of them, however, in any considerable number. One of the samples was taken on the 12th November, 1895, near the northernmost point reached by the 'Fram'. Another sample was taken on the 28th June, 1895, on the very surface of the sea, all the others from depths between 100 and 300 metres.

Digitized by Google

Fam. EUCHÆTIDÆ.

7. *Euchæta norvegica*, Boeck.
(Pl. XIV).

Syn: *Euchæta carinata*, Moebius.
„ „ *glacialis*, Hansen.

Remarks. Of this form a detailed description, accompanied with figures, has been given by the present author in his account of the Crustacea of the Norwegian North Atlantic Expedition. It was there pointed out that the *E. carinata* of Moebius is identical with Boeck's species, nor can I see any essential difference between it and the form subsequently recorded by Dr. Hansen from the Kara Sea as *E. glacialis*. In the accompanying plate, I give improved habitus-figures of both sexes, from specimens collected during the Nansen Expedition.

Occurrence. Of this magnificent Calanoid, specimens were found in almost all the samples, and it seems, indeed, to be as common in the eastern as in the western part of the polar basin traversed by the 'Fram'. The largest female specimens, some of which still had their large, flattened ovisac adhering to the genital segment, measured in length about 10 mm., a truely gigantic size for a free Copepod. An unusually large 'Nauplius' found in some of the samples taken north of the New Siberian Islands, I believe to be the larva of this Calanoid.

Distribution. Coast of Norway (chiefly in great depths), the German Ocean, several stations of the Norw. North Atl. Expedition, the Kara Sea.

Fam. ÆTIDIIDÆ.

Gen. *Undeuchæta*, Giesbrecht.

Remarks. Of this genus, established by Dr. Giesbrecht, hitherto only 2 species are known, *U. major* and *minor*, both from the tropical parts of the Atlantic and Pacific Oceans. One of these *(U. major)* was believed to be perhaps identical with the form recorded by Brady from the Challenger Expedition as *Euchæta australis*. The genus is chiefly characterised by the structure of the posterior maxillipeds. In this, as also in most other characters, a very large-sized Calanoid from the Nansen Expedition seems to

Digitized by Google

agree perfectly with the 2 species recorded by Dr. Giesbrecht, and accordingly ought to be referred to the same genus.

8. *Undeuchæta spectabilis*, n. sp.
(Pl. XV, XVI).

Specific Characters. Body of female rather robust, with the anterior division oblong oval in form, that of male considerably more slender, cephalic segment coalesced with the 1st pedigerous one; last segment, however, well defined in both sexes, though very small, its lateral corners produced in female to a short, deflexed, angular projection. Front produced below to a very small, pointed, rostral prominence. Tail in female scarcely more than 1/3 as long as the anterior division, and having the segments very sharply marked off from each other. Caudal rami very short, scarcely as long as they are broad, and somewhat divergent, apical setæ very strong and densely plumose. Anterior antennæ in female about the length of the anterior division of the body, and 24-articulate, 1st joint with 2 very conspicuous plumose setæ; those in male comparatively more slender, and composed of only 22 articulations, partly clothed with delicate sensory filaments. Posterior maxillipeds very slender, 2nd basal joint exceedingly long and narrow, terminal part short, not even attaining a length equal to 1/3 of that joint. 1st pair of natatory legs with the first 2 joints of the outer ramus coalesced; 4th pair with 5 strong spines inside the 1st basal joint. Last pair of legs wholly wanting in female, in male exceedingly large and powerful, with both legs biramous and of rather complex structure. Length of adult female 8 mm., of male 6 mm.

Remarks. This, next to *Euchæta norvegica*, is the largest Calanoid collected during the Expedition, equalling in size even the largest specimens of *Calanus hyperboreus*. This, indeed, will suffice to distinguish it from the 2 other species of the genus, which are very much smaller.

Description of the Female.

The length of the specimen examined, which seems to be fully grown, measures no less than 8 mm., not including the caudal setæ; and this form accordingly attains a size nearly twice that of the largest of the 2 species recorded by Dr. Giesbrecht, *U. major*, the length of which is only 4·50 mm.

Digitized by Google

The general form of the body (see Pl. XV, figs. 1, 2) is rather robust, resembling somewhat that of the species of the next genus *(Chiridius)*. The anterior division of the body is moderately vaulted above (see fig. 2), and, seen dorsally (fig. 1), oblong oval in form, with the greatest width scarcely more than 1/3 of the length, and occurring about in the middle. The anterior extremity appears obtusely blunted, and the posterior, as usual, deeply emarginated in the middle. The cephalic segment is coalesced with the 1st pedigerous one, only a very slight constriction occurring between them, but no distinct suture (see fig. 2). The last segment, on the other hand, is well defined from the preceding one by a distinct, somewhat arcuate suture. This segment is very small, and has the lateral parts somewhat produced behind, terminating in a short, slightly deflexed, angular corner (see fig. 2). The rostral prominence is small, but distinct, terminating in a simple acute point.

The tail is comparatively short, scarcely exceeding 1/3 of the length of the anterior division. It is, as usual, composed of 4 segments, which are very sharply marked off from each other, and each provided at the end with a circlet of small spinules. Of the segments, the 1st, or genital segment is, as usual, the largest, about equalling in length the 2 succeeding ones combined. It has its greatest width beyond the middle (see fig. 1), and below forms a rounded protuberance, to which, in the specimen examined, a small spermatophore was attached (see fig. 2). The last segment is rather small and obliquely cut off on each side for the articulation with the caudal rami. The latter are very short, being scarcely longer than they are broad, and are somewhat divergent. They are finely ciliated inside, and each carry at the tip 4 very strong and densely plumose setæ of moderate length and but little differing in size. Moreover, a small, unciliated bristle occurs on each ramus outside the setæ.

Of any eye, no trace could be detected, though it is very likely that it has existed in the fresh state of the animal.

The superior antennæ (fig. 8) are about the length of the anterior division of the body, and are composed of 24 well-defined articulations, the 8th of which, as in the preceding forms, is somewhat larger than the next adjacent ones, and probably represents 2 united articulations. To the 1st articulation, 2 rather conspicuous plumose setæ are attached. For the rest, the antenna

Digitized by Google

carries in front simple bristles of somewhat unequal length, and scattered, rather small, sensory appendages.

The posterior antennæ (fig. 4) have the outer ramus about twice as long as the inner, and composed of 7 joints, the 2nd and last of which are the largest, with 4 very short articulations between them. The ramus carries 9 long plumose setæ, 3 of which issue from the tip.

The mandibles (fig. 5) are rather strong, with the masticatory part considerably expanded. Of the cutting teeth, the outermost is the largest. and, claw-shaped; the 2 succeeding ones are likewise rather large and bidentate at the tip, whereas the others are rather small and closely crowded together. The palp is scarcely more than half the length of the body of the mandible, and has the 2 rami of equal size, the basal part being quadrangular in form, and carrying, inside, 3 ciliated bristles.

The maxillæ (fig. 6) have the masticatory lobe of moderate size and clothed with about 12 denticulated spines. The vibratory plate is well developed, carrying 8 plumose setæ, of which the middle ones are very much prolonged. On the outer part of the maxilla, or the palp, the median lobe, constituting the distal part of the basal joint together with the inner ramus, is unusually prolonged, and the setæ issuing from the end of this lobe are very densely crowded together in a brush-like manner. The outermost lobe, constituting the outer ramus, is comparatively small, and is fringed with 10 curved setæ.

The anterior maxillipeds (fig. 7) are short and thick, with the 5 digitiform lobes closely crowded together, and clothed with coarsely ciliated setæ of moderate length. On each of the 2 outermost lobes, one of the setæ assumes the character of a claw-like spine. The setæ issuing from the 2 terminal joints are rather small, though distinctly ciliated.

The posterior maxillipeds (Pl. XVI, fig. 4) exhibit a rather characteristic appearance, being very slender and elongated, more than 3 times as long as the anterior. The 1st basal joint is oblong quadrangular in form, and exhibits in front 3 successive slight prominences, clothed with a restricted number of short setæ. The 2nd basal joint is fully twice as long as the 1st, and very narrow, almost linear in form. Its anterior edge is finely ciliated in its proximal part, and somewhat beyond the middle it carries 3 unequal setæ. The terminal part is comparatively short, scarcely 1/3 the length of the 2nd basal joint, and is more or less strongly incurved. It is composed of 5 joints, the

Digitized by Google

2nd of which is the largest. Some of the setæ clothing this part are spiniform, and 2 of those issuing from the 1st joint are considerably longer than the others, and are coarsely ciliated at the base.

The natatory legs (figs. 5—8) are powerfully developed, and, on the whole, resemble in structure those in the *Scolecithricidæ*. The 1st pair (fig. 5), however, are rather small, as compared with the others, and have the first 2 joints of the outer ramus imperfectly defined, being only indicated by the presence of 2 successive spines on the outer edge; of these the distal one is attached to a projecting knob-like expansion of the joint. The inner ramus in this pair is uniarticulate, with the outer edge bulging in the middle. In the 2nd pair (fig. 6) this ramus is distinctly biarticulate, and in the 2 posterior pairs (figs. 7, 8), it is composed of 3 well-defined joints. The outer ramus in the 3 posterior pairs is very large and broad, with the apical spine coarsely serrate outside. The number of natatory setæ and spines on the rami is exactly the same as in the *Scolecithricidæ* described above. In none of the pairs, however, could any spinules of the posterior face be detected. On the other hand, the 4th pair (fig. 8) is distinguished by 5 closely-set spines issuing inside the 1st basal joint, immediately above the plumose seta.

Behind the natatory legs, not the slightest trace of any limbs could be detected, and indeed, this total absence in the female of the last pair of legs is a character common to all the forms included in the present family.

Description of the Adult Male.

The length of the solitary specimen examined, which seems to be fully grown, is about 6 mm., and the male, accordingly, does not nearly attain the size of the female.

The general form of the body (see Pl. XVI, fig. 1) is rather more slender than in the female, with the anterior division narrow oblong, and having the lateral corners of the last segment less produced. The tail is somewhat more elongated in proportion to the anterior division, and is rather slender, being, as usual, divided into 5 segments, the last of which, however, is so very small, as easily to escape attention. The caudal rami with their apical setæ are about as in the female.

The anterior antennæ (fig. 2) appear more slender and attenuated than in the female, and are only composed of 22 articulations, the 8th and 9th

Digitized by Google

and the 11th and 12th being coalesced. The sensory appendages are more fully developed than in the female, and are more numerous, especially in the proximal part of the antenna.

The oral parts, as is not unfrequently the case in male Calanoids, are imperfectly developed and rather unlike those in the female. Even the posterior maxillipeds (fig. 3) look rather different, and more resemble those in the next genus *(Chiridius)*.

The last pair of legs (fig. 9) are quite enormously developed, considerably exceeding in length even the whole tail, and, as usual, are rather asymmetrical, though both legs are found to be biramous. The 1st basal joints of the 2 legs are united, and together form a rather irregular piece considerably more expanded on the left than on the right side. The 2nd basal joint on both legs is very tumid, but is conspicuously larger on the left than on the right leg. On the other hand, the rami in the latter are longer than in the former. The outer ramus of the right leg, as in the genus *Undinella*, consists of 2 highly chitinized pieces, movably articulated to each other. The proximal piece in this form also is somewhat bow-shaped and considerably longer than the distal one, which projects inside to a rounded lobe. The outer ramus of the left leg is composed of 3 distinct joints, the 1st of which is about the length of the other 2 combined. The last joint is longer than the 2nd, to which it is very movably articulated, and it is slightly bilobular at the tip. The inner ramus is uniarticulate on both legs, and essentially of the same appearance, though that of the right leg is longer and more slender. In both legs, this ramus terminates in a slightly curved lamellar expansion.

Occurrence. Of this large and conspicuous Calanoid, only 2 specimens, a female and a male, were found, both, however, being in a very perfect state of preservation, and therefore admitting of a rather minute examination. They both occurred in a sample taken between March 23rd and April 4th, 1895, near the 84th degree of latitude, the tow-net having been lowered to 130 metres.

Gen. *Chiridius*, Giesbrecht.

Remarks. This genus was established by Dr. Giesbrecht in the year 1892, to include a solitary species from the Gulf of Naples, *C. Poppei*, the chief character distinguishing it from *Undeuchæta* being the absence of a rostral projection, the spiniformly produced lateral corners of the last pedigerous segment,

Digitized by Google

and the somewhat different structure of the posterior maxillipeds. In these characters, I find that a Norwegian Calanoid, long ago recorded by Boeck as *Euchæta armata*, perfectly agrees. This form, which is still very imperfectly known, also occurred rather plentifully in the samples taken during the Nansen Expedition, and in addition to it, 2 well-marked new species were found, undoubtedly belonging to the same genus, though differing in the presence of a very small but distinct rostral prominence. All these 3 species will be described below, figures of them being given in the accompanying plates.

9. *Chiridius armatus* (Boeck).
(Pl. XVII).

Euchæta armata, A. Boeck, Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forh. f. 1872, p. 39.

Specific Characters. Body moderately slender, with the tail almost half the length of the anterior division. Rostral projection quite obsolete. Last segment of trunk with the lateral corners gradually narrowed to acute processes pointing slightly outwards. Caudal rami rather longer than they are broad. Anterior antennæ slightly exceeding in length the anterior division of the body, and very slender, 24-articulate. Posterior antennæ with the inner ramus rather short and thick, scarcely more than half as long as the outer. Mandibular palps with the inner ramus very poorly developed. Oral parts in male much reduced. 1st pair of natatory legs with the outer ramus distinctly 3-articulate, 1st joint carrying the usual spine outside. Inner ramus of 1st and 2nd pairs uniarticulate, that of 3rd and 4th pairs 3-articulate. Legs of last pair in male rather feeble, and simple, styliform. Length of adult female 4·30 mm., of male 3·30 mm.

Remarks. This form, as above stated, was first recorded by the late A. Boeck as a species of the genus *Euchæta*. It was, however, like the other forms recorded by him, very imperfectly characterized, and no figures were given. For this reason, its true relationship to other forms was not recognized by Dr. Giesbrecht, who places it among other doubtful species, the genus of which could not be determined. There cannot, however, be any doubt, that Boeck's species is congeneric with that described by Dr. Gies-

Digitized by Google

brecht as *Chiridius Poppei*, though it is easily distinguishable, not only by its much larger size, but also by several structural details.

Description of the Female.

The length of the largest specimens in the collection is 4·30 mm., and this form accordingly grows to rather more than twice the size of the Mediterranean species, the length of which is only 1·80 mm.

The general form of the body (see figs. 1 & 2) is moderately slender, with the anterior division oblong oval in form, and but slightly vaulted above (see fig. 2). Seen dorsally (fig. 1), the front appears obtusely truncated; in a lateral view of the animal (fig. 2), however, it is found to be narrowly rounded, with no trace of any rostral projection below (see also fig. 3). The cephalic and 1st pedigerous segments are completely coalesced, and the same is also the case with the last 2 segments, so that the anterior division only exhibits 4 distinctly-defined segments, the 1st of which is about twice the length of the other 3 combined. The lateral corners of the last segment gradually contract to acute, spiniform processes, which point somewhat outwards (see also fig. 4).

The tail is rather slender, being almost half as long as the anterior division, and is cylindrical in form. It is, as usual, divided into 4 segments, the 1st of which, the genital segment, is somewhat shorter than the 2 succeeding ones combined, and forms a rounded protuberance below. The last, or anal segment (see fig. 13) is much shorter than the preceding ones, and is somewhat obliquely truncated at the end on each side. The caudal rami are considerably longer than they are broad, are finely ciliated inside, and each carry 3 strong plumose setæ of about equal length. In addition to these, a very short, unciliated bristle is seen at the base of the outermost seta, and another, still more delicate bristle, at the inner corner.

The eye could only be faintly traced in the alcoholic specimens. In fresh specimens it is very conspicuous and of unusual size, with bright red pigment.

The anterior antennæ (see figs. 1 & 2) slightly exceed in length the anterior division of the body. They are very slender and attenuated, and composed of 24 well-defined articulations, the 8th being, in this instance also,

Digitized by Google

conspicuously larger than those immediately adjacent to it. The antennæ are clothed anteriorly with delicate bristles of somewhat unequal length.

The posterior antennæ (fig. 5) have the inner ramus comparatively short, scarcely exceeding half the length of the outer, which is distinctly 7-articulate.

The mandibles (fig. 6) are rather strong, with the masticatory part greatly expanded, and the cutting teeth well developed. The palp is of moderate size, and highly characterised by the poor development of the inner ramus, which is extremely small, and has the terminal setæ unusually short in proportion to those of the outer ramus.

The maxillæ (fig. 7), on the whole, resemble in structure those in the genus *Undeuchæta*.

The anterior maxillipeds (fig. 8) are likewise constructed upon the same type as in that genus; but all the setæ springing from the digitiform lobes are of equal structure, none of them assuming a spiniform character.

The posterior maxillipeds (fig. 9) are rather slender and doubly geniculate, the 2 basal joints forming with each other a more or less pronounced elbow-shaped flexure, whereas the terminal part is bent in the opposite direction, or reflexed. The latter is about half the length of the 2nd basal joint, 5-articulate, and densely clothed with slender setæ.

The natatory legs (figs. 10—12) are built upon the same type as in the Calanoids described in the preceding pages. They are, however, less powerful than in *Undeuchæta*, with the outer ramus less dilated. In the 1st pair (fig. 10) this ramus is distinctly 3-articulate, the 1st joint being well defined, and provided outside with the usual spine. The inner ramus, both in this and the 2nd pair (fig. 11), is uniarticulate, though in the latter pair there is a very slight indication of the separation of a short proximal joint. In the 2 posterior pairs (fig. 12) this ramus is, as usual, 3-articulate; but the boundary between the 2 proximal joints is far from being distinct. The last pair of legs, as in *Undeuchæta*, are wholly absent.

The adult male is rather smaller than the female, scarcely exceeding a length of 3 mm., and is easily recognizable by the much more slender tail, and the dense clothing of sensory filaments on the anterior antennæ.

The oral parts are much reduced, excepting the mandibular palps and the posterior maxillipeds, the former (fig. 4) having the inner ramus less

Digitized by Google

rudimentary than in the female, the latter scarcely exhibiting any perceptible difference either in size or structure.

The last pair of legs (fig. 15) are much feebler and simpler in structure than in the male of *Undeuchæta*, each leg forming a simple styliform stem, composed of 5 not very distinctly defined joints, the first 2 of which represent the basal part, the 3 distal ones the outer ramus. The right leg is rather longer than the left, which is strongly incurved.

Occurrence. This form occurred in no less than 14 of the samples, and in some of them rather abundantly. It may be worthy of note that it was also present in the sample which is stated to have been taken from the very surface of the sea, by skimming the water in a temporary creek in the ice.

Distribution. Coast of Norway, occurring in great abundance at depths beyond 150 fathoms, especially in the deep fjords.

10. *Chiridius tenuispinus*, n. sp.

(Pl. XVIII).

Specific Characters. ♀. Body comparatively less slender than in the preceding species, with the tail shorter, scarcely exceeding 1/3 of the length of the anterior division. Front produced below to a distinct, though very small acute point. Last segment of trunk with the lateral corners produced to very slender, posteriorly-pointing spines, sharply marked off from the segment. Anterior antennæ about as in the preceding species. Posterior antennæ, however, differing in the far greater length and comparative narrowness of the inner ramus. Mandibular palps fully as long as the body of the mandible, inner ramus less rudimentary than in *C. armatus*, outer ramus very largely developed. Anterior maxillipeds with 2 of the outer setæ spiniform. Posterior maxillipeds comparatively more slender than in *C. armatus*. 1st pair of natatory legs with the first 2 joints of the outer ramus coalesced. Inner ramus of 2nd pair distinctly biarticulate. Length of adult female about 4 mm.

Remarks. This new species is easily distinguishable from the preceding one by the somewhat more robust form of the body, and especially by the very slender spiniform processes issuing from the lateral corners of the last segment of the trunk. In the other structural details also, some minor differences are found to exist, as will be seen by comparing the detail-figures here

Digitized by Google

given with those of *C. armatus*. Any more detailed description is not, I think, needed.

Occurrence. This form was found in 6 of the samples, 5 of them belonging to the eastern part of the basin traversed, the 6th lying about in the middle, near the 85th degree of latitude. The last sample was taken from the very surface of the sea, whereas the others were from some considerable depth below the ice. Only female specimens were found.

11. *Chiridius brevispinus*, n. sp.
(Pl. XIX).

Specific Characters. ♀. Body comparatively robust, with the anterior division more than 3 times as long as the posterior, and rather massive, oblong oval in form. Front produced below to a distinct, though not very large, acute rostral projection. Spiniform processes of last segment of trunk very small and somewhat incurved. Caudal rami about as in *C. tenuispinus*. Antennæ and oral parts likewise resembling in structure those organs in the latter species. 1st pair of natatory legs with the outer ramus distinctly 3-articulate, 1st joint, however, without any spine outside; the 3 succeeding pairs normal. Length of adult female reaching 4·80 mm.

Remarks. This is a rather large and robust species, somewhat resembling in its outward appearance the above-described species of the genus *Undeuchæta*. It is, however, a true *Chiridius*, agreeing in all more essential characters with the other species of this genus, though easily distinguishable from any of them, both by its large size and its robust form of body, and especially by the very short spiniform processes of the last pedigerous segment.

Of this species also, I do not think it necessary to give any more detailed description.

Occurrence. This species, like the preceding one, occurred in 6 of the samples, but not the same as that form, as 5 of them belonged to the western part of the basin traversed. In one of the samples, taken between March 26th and April 4th, 1895, in about the 84th degree of latitude, it occurred rather plentifully; but no male specimens were found.

Digitized by Google

Fam. PSEUDOCALANIDÆ.[1]

Gen. *Pseudocalanus*, Boeck.

Syn: *Clausia*, Boeck (not Claparede).
„ *Lucullus*, Giesbrecht.

Remarks. This genus was established as early as in the year 1864 by Boeck; but the name at that time proposed, *Clausia*, having been already appropriated, it was subsequently changed by him to *Pseudocalanus*. Dr. Giesbrecht did not at first recognize Boeck's genus, that named by him *Lucullus* being the very same. As yet, only a single species of this genus is known; for the species recorded by Boeck as *Pseudocalanus armatus* is generically distinct, and even belongs to a different family, *Ætidiidæ*. In the samples taken during the 'Fram' Expedition, I have found 3 species referable to this genus. One of them is the type species originally recorded by Boeck.

12. *Pseudocalanus elongatus*, Boeck.

Syn: *Lucullus acupes*, Giesbrecht.

This well-known form occurred not infrequently in some samples taken between the 12th and 24th October, 1893, north of the New Siberian Islands. It was also found occasionally in a sample taken farther north.

Distribution. Coast of Norway, British Isles, west coast of France, Kiel Bay, the Baltic.

13. *Pseudocalanus major*, n. sp.

(Pl. XX).

Specific Characters. Very like the type species as to external appearance, but almost twice as large. Anterior division of body regularly oblong oval in form, scarcely broader in front than behind, and only composed of 4 segments, the last one with the lateral parts rounded off behind. Tail nearly half as long as the anterior division, genital segment about the length of the 2 succeeding ones combined, and rather protuberant below in its anterior part,

[1] The corresponding subfamily is termed by Dr. Giesbrecht *Clausocalaninæ* from the genus *Clausocalanus*; but as *Pseudocalanus* is of much earlier date, the name of the family should, according to the rule in zoology, rather be derived from that genus.

Digitized by Google

anal segment shorter than the preceding one. Caudal rami comparatively narrow, about 3 times as long as they are broad, and separated by a rather broad interval, though scarcely at all divergent, tip obtusely truncated, with a slight angular projection outside the caudal setæ; the latter 4 in number, and of moderate length. Anterior antennæ in female, when reflexed, reaching somewhat beyond the middle of the tail, and composed of 23 articulations, the 1st and 7th much larger than the others. Posterior antennæ and oral parts about as in the type species. Natatory legs likewise of a very similar structure, though comparatively somewhat more slender. Last pair of legs in male extremely slender, right leg with the terminal styliform part occupying more than half its length. Length of adult female 2·40 mm., of male 1·80 mm.

Remarks. This form so very closely resembles the type species, that I should have been much inclined to regard it only as a large variety, if both forms were not found together in the very same samples, without exhibiting any transitions. On a closer examination, indeed, some few minor differences may be also proved to exist in the structural details.

Description of the female.

The average length of adult specimens is 2·40 mm, whereas in the type species it scarcely exceeds 1·40 mm.

The general form of the body (see figs. 1 and 2) is rather slender and elongated, though perhaps somewhat less so than in the type species. The anterior division is but slightly vaulted above (see fig. 2), and, seen dorsally (fig. 1), exhibits a rather regular oblong oval form, with the greatest width about in the middle, and gradually narrowed both in front and behind. The anterior extremity appears narrowly rounded, the posterior somewhat broader and slightly emarginated in the middle. The cephalic segment is completely coalesced with the 1st pedigerous one, and the same is also the case with the last 2 segments, the whole division being accordingly composed of only 4 distinctly-defined segments, the 1st of which is nearly twice as large as the other 3 combined. The lateral parts of the last segment are rounded off, and the front carries below, as in the type species, 2 very delicate tentacular filaments.

Digitized by Google

The tail almost attains half the length of the anterior division, and is divided into 4 well-defined segments. The 1st, or genital segment, as usual, is much the largest, though scarcely attaining the length of the 2 succeeding ones combined. It is slightly dilated in front of the middle, and forms below at its anterior extremity a rather conspicuous rounded protuberance. The last, or anal segment is scarcely more than half as large as the preceding one, and is almost transversely truncated at the end. The caudal rami (see fig. 12) are narrower and more elongated than in the type species, being about 3 times as long as they are broad. They are scarcely at all divergent, though separated by a rather broad interspace, and they have the tip obtusely truncated, with a small projecting corner outside the caudal setæ. The latter, on each ramus, are 4 in number, all apical and of moderate length, the innermost but one being, as usual, the longest.

The anterior antennæ (fig. 3) are rather slender, and, when reflexed, extend about to the middle of the tail. They are each composed of only 23 articulations, the rather elongated 7th articulation apparently representing 3 united joints. The antennæ carry in front comparatively short and delicate bristles.

The posterior antennæ (fig. 4) have the outer ramus considerably longer than the inner, and 6-articulate, all the joints being setiferous.

The mandibles (fig. 5) are moderately strong, with the masticatory part rather expanded, and the cutting teeth well developed, though rather short. The palp is fully as long as the body of the mandible, and has the basal part obliquely produced at the inner corner, so that the inner ramus projects considerably beyond the outer.

The maxillæ (fig. 6) are of quite normal structure, resembling those in the type species.

The anterior maxillipeds (fig. 7) have the 5 digitiform lobes less densely crowded together than in the Calanoids described in the preceding pages, and the setæ issuing from them are rather strong and coarsely ciliated, none of them, however, assuming a spiniform character. The apical setæ issuing from the 3 very small distal joints, are well developed, resembling those of the digitiform lobes.

The posterior maxillipeds (fig. 8) are moderately slender, about twice as long as the anterior, and have the 2 basal joints of about equal length. The terminal part is a little shorter and not reflexed.

Digitized by Google

The natatory legs (figs. 9—11) considerably increase in length posteriorly, the 4th pair being nearly twice as long as the 1st. In structure they agree, on the whole, with those in the preceding Calanoids, the inner ramus being much smaller than the outer, uniarticulate on the 1st pair, biarticulate on the 2nd, and 3-articulate on the 2 posterior pairs. Both rami are comparatively more slender than in the type species, but are otherwise of exactly the same structure. The last pair of legs are, as in the type species, wholly absent.

The adult male, of which only a solitary specimen was found, closely resembles the male of *P. elongatus*, but is considerably larger, measuring in length 1·80 mm. It is easily recognizable from the female, both in its external appearance and in the structure of the several appendages, which, on the whole, closely agrees with that in the type species.

The last pair of legs (fig. 13) are very slender, each leg forming a simple stem, which, however, is rather different on the two sides. The left leg is a little longer than the right, and is composed of 5 distinctly-defined joints, the first 2 of which may represent the basal part, the other 3 the terminal part or more properly the outer ramus. The joints of this latter part rapidly diminish in size, the 1st being about the length of the 2nd basal joint, whereas the last is extremely small and hook-shaped. The right leg, contrary to what is the case in the left, has the 1st basal joint considerably larger than the 2nd, and much more dilated at the base. The terminal part forms a slender styliform piece, occupying considerably more than half the length of the leg, and exserted to a very acute point. In the type species this piece is divided into 2 well-defined joints, which, however, in the present form are scarcely distinguishable at all.

Occurrence. This form was found rather abundantly in the samples taken between the the 12th and 24th October, 1893, north of the New Siberian Islands. As stated above, it occurred here together with the type species, from which it was at once distinguished by its much larger size. It was also found occasionally in 2 other samples taken on the 11th and 19th April, 1894, in about the 80th degree of latitude.

Digitized by Google

14. *Pseudocalanus pygmæus*, n. sp.

(Pl. XXI).

Specific Characters. ♀. Body much shorter and thicker than in the 2 preceding species, with the anterior division rather more tumid, and somewhat broader in front than behind, consisting of only 4 distinctly defined segments. Front, as in the type species, with 2 delicate filaments below. Last segment of trunk with the lateral corners rounded off. Tail scarcely more than 1/3 as long as the anterior division, genital segment short and broad, anal segment scarcely smaller than the preceding one. Caudal rami comparatively short, each with 4 apical setæ. Anterior antennæ fully as long as the body, and 23-articulate. Posterior maxillipeds comparatively longer than in the 2 preceding species, with the terminal part more produced and generally reflexed, Natatory legs very slender, with the apical spine of the outer ramus exceedingly long and narrow. Length of adult female 0·86 mm.

Remarks. In its external appearance and very small size, this form so strongly recalls *Paracalanus parvus* Claus, that at first I believed it to be that species. A closer examination, however, showed it to be in reality very different, and much more nearly related to *Pseudocalanus elongatus*. Indeed, in all essential structural details, it agrees with this latter form, and ought therefore, in my opinion, to be referred to the same genus, in spite of its very different external appearance.

Description of the Female.

The length of the largest specimens found is only 0·86 mm, and this form is accordingly one of the smallest Calanoids known, being even somewhat inferior in size to *Paracalanus parvus* Claus.

The general form of the body (see figs. 1 & 2) very much resembles that in the above-named species, the anterior division being rather tumid, and having its greatest width in front of the middle. The cephalic segment is wholly coalesced with the 1st pedigerous one, both forming together a very large segment occupying more than 2/3 of the whole division. Behind it, only 3 other segments appear belonging to the trunk, the last 2 segments being likewise united into one. The lateral corners of this segment, as in the 2

Digitized by Google

preceding species, are rounded off. The front carries below (see fig. 3) the usual small tentacular filaments.

The tail (fig. 5) is comparatively much shorter than in the 2 preceding species, scarcely exceeding $^1/_8$ of the length of the anterior division. It is divided into 4 well-defined segments, the 1st of which, the genital segment, is considerably dilated in the middle, and about the length of the 2 succeeding segments combined. The last, or anal segment is fully as large as the preceding segment, and almost transversely truncated at the end. The caudal rami are comparatively short, being scarcely twice as long as they are broad, and each carry at the tip 4 plumose setæ of moderate length. Moreover, a very small bristle is seen issuing from the inner corner of each ramus.

The anterior antennæ (fig. 5) are rather slender and elongated, extending, when reflexed, to the end of the caudal rami. In structure, they exactly agree with those in the preceding species.

The posterior antennæ (fig. 6) likewise resemble those in *P. major*, except that the 2nd joint of the outer ramus has only a single seta at the end, whereas in the 2 other species this joint carries 4 setæ.

The mandibles (fig. 7), maxillæ (fig. 8), and anterior maxillipeds (fig. 9) do not exhibit any essential difference from those appendages in the other 2 species.

The posterior maxillipeds (fig. 10), on the other hand, are rather more produced, and have the terminal part comparatively longer, and more generally reflexed.

The natatory legs (figs. 11—13), on the whole, agree in structure with those in the 2 preceding species, though some minor differences may be found to exist. Thus in the 1st pair (fig. 11), the 1st joint of the outer ramus is without the usual spine outside, and the inner ramus has only 4, instead of 5 natatory setæ. In the 3 other pairs (figs. 12—14) the apical spine of the outer ramus is exceedingly long and slender, being much longer than the terminal joint, and in the 4th pair (fig. 13) almost as long as the whole ramus. As in the other species of this genus, no trace of any 5th pair is present in the female.

Digitized by Google

Occurrence. This small Calanoid occurred in considerable numbers in the samples taken north of the New Siberian Islands, in October, 1893; no male specimen, however, was found.

Gen. *Spinocalanus*, Giesbrecht.

Remarks. This genus was established by Dr. Giesbrecht, to include a small Calanoid found in the tropical part of the Pacific Ocean, at a very considerable depth (1000—4000 metres), for which reason the species was named *S. abyssalis*. As the specimens were in a somewhat imperfect state of preservation, only some few detail-figures were given, to show the more important anatomical characters. On comparing these figures with those of a small Calanoid from the Nansen Expedition, I find so close a resemblance, that I am induced to refer this form to the same genus. The characteristic structure of the maxillipeds in particular, is the very same in the two forms; and the dense clothing of spinules on the natatory legs also, from which the generic name has been derived, is found to be very distinct at least on the inner ramus. The total absence of any rostral prominence or frontal appendages is likewise a character common to both forms.

15. *Spinocalanus longicornis*, n. sp. (Pl. XXII).

Specific Characters. Body in both sexes comparatively short and thick, though rather different as regards the relative length of the 2 chief divisions. Cephalic segment not distinctly defined from the 1st pedigerous one, and somewhat applanated anteriorly, front quite simple, without the slightest trace of rostral prominence or tentacular filaments. Last 2 segments of trunk coalesced, lateral corners rounded off. Tail in female not even attaining 1/8 of the length of the anterior division, in male considerably more slender and elongated. Caudal rami comparatively short, each with 4 apical setæ. Anterior antennæ considerably exceeding in length the whole body, in female 23-articulate, 7th articulation, especially in the male, very much elongated. Posterior maxillipeds very slender, with the terminal part almost twice as long as the 2nd basal joint, and clothed with very long and coarsely ciliated setæ. Natatory legs slender, inner ramus in the 3 posterior pairs armed behind

Digitized by Google

with several rows of spinules. Last pair of legs wanting in female, rather small in the male, left leg 5-articulate, right 3-articulate, and scarcely more than half as long as the left. Length of adult female 1·12 mm., of male 1·08 mm.

Remarks. This is likewise a very small Calanoid, though somewhat larger than the above-described *Pseudocalanus pygmæus*, from which it is at once distinguished by the exceedingly long anterior antennæ, and the flattened, quite unarmed front.

Description of the Female.

The length of the body in fully adult specimens does not seem to exceed 1·12 mm., and this form is accordingly of about the same size as the type species, the length of which is indicated by Dr. Giesbrecht to vary from 1·10 mm. to 1·25 mm.

The general form of the body (see figs. 1 & 2) is comparatively short and compact, with the anterior division more than 3 times as long as the posterior, and moderately vaulted above (see fig. 2). Seen dorsally (fig. 1), this division exhibits a rather regular oblong oval form, with the greatest width behind the middle, the anterior extremity being obtusely rounded, the posterior scarcely broader, and but slightly emarginated in the middle. The cephalic segment is coalesced with the 1st pedigerous one, no distinct boundary being observable between them (in the type species, such a boundary is said to be present). Its frontal part is somewhat flattened, appearing, in a lateral view of the animal (fig. 2), narrowly rounded and without any trace either of a rostral prominence, or of tentacular filaments (see also fig. 3). The lateral corners of the last segment, which more properly represents 2 united segments, are not at all produced behind, but evenly rounded off.

The tail is very short, and, as usual, composed of 4 segments, the 1st of which, the genital segment, is somewhat dilated in front of the middle, and exhibits below a rather conspicuous rounded protuberance. The last, or anal segment (see fig. 12), is of about the same size as the preceding one, and is slightly insinuated behind between the insertions of the caudal rami. The latter are very short, scarcely longer than they are broad, and, as in *Pseudocalanus*, carry each 4 plumose setæ and a small bristle at the inner corner.

The anterior antennæ (see figs. 1 & 2) are very strongly developed, and much longer than the whole body, projecting, when reflexed, about

Digitized by Google

a 5th of their length beyond the caudal rami. They are composed, as in the 2 above-described species of *Pseudocalanus*, of 23 articulations, the 7th of which is rather elongated.

The posterior antennæ (fig. 4) have the outer ramus longer than the inner, both being of exactly same structure as in *Pseudocalanus*.

The anterior lip (see fig. 3) is rather prominent, and densely hairy at the end.

The mandibles (fig. 5) resemble those in *Pseudocalanus*, but have the basal part of the palp less produced at the inner corner, for which reason the inner ramus does not project beyond the outer.

The maxillæ (fig. 6) do not exhibit any peculiarity in their structure.

The anterior maxillipeds (see fig. 7) are well developed, and, on the whole, built upon the same type as in *Pseudocalanus*, with the digitiform lobes well separated, and clothed with coarsely ciliated setæ, the apical setæ being likewise rather strong, though somewhat shorter.

The posterior maxillipeds (ibid.) are more than 3 times as long as the anterior, and have the terminal part unusually prolonged, being almost twice the length of the 2nd basal joint. Of the 5 articulations composing this part, the 2nd is much the largest, equalling in length the 2 succeeding ones combined. The setæ of this part are all coarsely ciliated, and some of the outer ones are of very considerable length. The perfect agreement in structure of these limbs with those in the type species is very obvious on comparing the figure here given with that reproduced in Dr. Giesbrecht's great work.

The natatory legs (figs. 8—11) are very slender, and in structure resemble those in the genus *Pseudocalanus*, except that the inner ramus of the 3 posterior pairs is clothed on the posterior face with oblique rows of small spinules. In the type species the outer ramus also has similar spinules. Of the last (5th) pair of legs, no trace is to be detected.

The adult male (fig. 13), of which only 2 or 3 specimens were found, looks rather different from the female, and strongly recalls the male of *Pseudocalanus*. It is somewhat smaller than the female, scarcely exceding 1 mm. in length, and has the anterior division of the body comparatively broader and more ovoid in form, with the anterior extremity triangularly produced and slightly keeled dorsally. The muscles moving the antennæ and

Digitized by Google

mandibular palps are very conspicuous, and much stronger than in the female, originating close together along the median line.

The tail is much more slender and elongated, almost half as long as the anterior division, and is divided into 5 well-defined segments, the 1st of which is very small, the 2nd much the largest. The caudal rami are mobile and more or less widely divergent.

The anterior antennæ (see fig. 13) are considerably dilated in their proximal part, which is clothed in front with large sensory appendages in addition to the bristles. They are only composed of 22 articulations, of which the 1st and 7th are particularly large, the latter even equalling in length the 6 succeeding joints combined, and apparently representing 4 united articulations.

The posterior antennæ are more strongly developed than in the female, and this is also the case with the mandibular palps, whereas the oral parts otherwise appear much reduced.

The last pair of legs (fig. 14) are comparatively small and simple in structure, being built upon the same type as in *Pseudocalanus*. The 2 legs each form simple stems, but are very unequal in size, the right leg being scarcely more than half as long as the left, and only composed of 3 joints, the last of which is lamelliform, not, as in *Pseudocalanus*, styliform. The left leg, as in that genus, is composed of 5 well-defined joints, the last of which is very small, and hook-shaped.

Occurrence. This form occurred not infrequently in a sample taken February—March, 1894, in about the 80th degree of latitude, and was also found occasionally in another sample taken on the 22nd May of the same year, somewhat farther north and west.

16. *Drepanopus Bungei*, G. O. Sars.

This form, recently described by the present author from specimens taken by Dr. Bunge in the mouth of the Jana River, was found, though rather sparingly, in the same 2 samples in which *Spinocalanus longicornis* occurred.

Digitized by Google

Tribe: **HETERARTHRANDRIA.**

Fam. **HETEROCHÆTIDÆ.**

Gen. *Heterochæta*, Claus.

Remarks. Of this genus, established in the year 1863 by Prof. Claus, 6 species are recorded in Dr. Giesbrecht's work, 2 from the Bay of Naples, the other 4 from the tropical parts of the oceans. One of the latter, *H. abyssalis*, is identified with the form recorded by Prof. Brady from the Challenger Expedition as *H. spinifrons*, Claus. A 7th species of this genus was long ago recorded by Boeck from the Norwegian coast, under the name of *H. norvegica;* but as this species was very imperfectly characterised, its true relation to the other species could not of course be made out by Dr. Giesbrecht, who only mentions it as an undeterminable form. Boeck's species, which I have also observed myself off the Norwegian coast, is one of the most characteristic Calanoids of the Polar Basin, and together with it, I have found another, very distinct, new species. Both these species will be described below.

17. *Heterochæta norvegica*, Boeck.
(Pl. XXIII).

Heterochæta norvegica, A. Boeck, Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forh. f. 1872, p. 40.

Syn: *Heterochæta spinifrons*, Moebius (not Claus).

Specific Characters. Body rather slender, especially in the male, with the anterior division regularly oblong oval in form, and somewhat depressed in its anterior part, front surmounted by a compressed and angularly deflexed rostrum, carrying on the tip 2 long straight styliform appendages; lateral corners of last pedigerous segment rounded off. Tail nearly half the length of the anterior division, genital segment in female very large, with a saddle-like depression dorsally, and considerably protuberant below; left caudal ramus much larger than the right, and about equalling in length the last 2 segments combined; the prolonged seta of this ramus exceeding the length of the whole body. Anterior antennæ in female very slender and attenuated, somewhat longer than the body, and abruptly curved near the base; those in

Digitized by Google

male comparatively shorter, left antenna distinctly geniculate, but with the part preceding the geniculation only slightly dilated. Posterior antennæ, mandibles, maxillæ, and anterior maxillipeds about as in *H. spinifrons*. Posterior maxillipeds very narrow, with the 1st basal joint much shorter than the 2nd, and carrying, about in the middle of the anterior edge, an exceedingly long and slender, flexuous spine, exceeding half the length of the maxilliped. Last pair of legs in female with the incurved spine of the 2nd joint of the outer ramus cultriform, and shorter than the terminal joint; those in male with the 2nd basal joint of right leg produced inside to a falciform, ciliated process, terminal joint of outer ramus in the right leg oblong lamellar, in the left leg rounded, with a slender apical claw and 2 short lateral spines. Length of adult female 4·56 mm., of male 4·20 mm.

Remarks. This species is certainly very closely allied to *H. spinifrons* of Claus, but cannot, in my opinion, be regarded as identical with this species, since it seems to differ not only in its much larger size, but also in some of the structural details. The form recorded by Prof. Moebius from the North Sea as *H. spinifrons*, Claus, is unquestionably Boeck's species.

Description of the Female.

The average length of adult specimens is from 4·50 to 4·60 mm., and there is no difference in this respect between polar and Norwegian specimens. On the other hand, the length of *H. spinifrons* is indicated by Dr. Giesbrecht to be only from 3·00 to 3·15 mm., and that of the other species to be far less. The northern species accordingingly grows to a much larger size than does any of the other known species.

The general form of the body (figs. 1 & 2) is rather slender, with the anterior division about twice the length of the posterior. Seen dorsally (fig. 1), the former division exhibits a rather regular oblong oval form, with the greatest width in the middle, and about equalling $^2/_5$ of the length. The anterior extremity appears obtusely rounded, the posterior somewhat broader, and slightly emarginated in the middle. On a closer inspection, the anterior extremity is found to be surmounted in the middle by a sharply defined knob-shaped prominence, which in a lateral view of the animal (figs. 2 & 3) appears abruptly bent downwards, forming an angular rostrum. To the tip of this rostrum, 2 very long and delicate, perfectly straight filaments are

Digitized by Google

appended (see fig. 3). The cephalic segment is well defined from the 1st pedigerous one, and is somewhat applanated in its anterior part, exhibiting about in the middle of the dorsal face a well-marked cervical depression (see fig. 2). The last pedigerous segment is imperfectly defined from the preceding one, though not fully coalesced with it. Its lateral corners are rounded off.

The tail is composed of 4 well-defined segments, the 1st of which, the genital segment, is very large, attaining the length of the 2 succeeding ones combined. It exhibits dorsally, beyond the middle, a saddle-like depression, and is greatly protuberant below. In the specimen examined, a single large spermatophore was attached to the hind part of the segment below (see figs. 1 & 2). The 3 succeeding segments rapidly diminish in size, the last, or anal segment, being rather small and imperfectly defined from the caudal rami. The latter are rather produced and narrowed distally, pointing straight backwards. They are conspicuously asymmetrical, the left ramus being much larger than the right, and less distinctly defined from the anal segment. Each ramus carries 5 plumose setæ, 3 of which issue from the tip, the other 2 from separate ledges of the outer edge. The middle apical seta of the left ramus is enormously prolonged, considerably exceeding in length the whole body, its outer part being unciliated and hair-like. As in most other Calanoids, moreover, a small bristle is appended to the inner corner of each ramus.

The eye is wholly absent, as proved by the examination of fresh Norwegian specimens.

The anterior antennæ (see figs. 1 & 2) are extremely slender, and somewhat longer than the body, extending, when reflexed, a little beyond the end of the caudal rami. In all the specimens, they exhibit in their basal part an abrupt curvature, whereas the outer, extremely slender part is quite straight. They are composed of the full number of articulations (25), of which the 1st is by far the largest, and is somewhat compressed. Along the anterior edge they are clothed with slender, somewhat unequal bristles, which, especially in the proximal part, are densely crowded together.

The posterior antennæ, mandibles, maxillæ, and anterior maxillipeds closely agree in their structure with those appendages in the type species, for which reason I have not considered it necessary to give figures of them. In the next species, these limbs will be described in detail, and the differences from those in the present species pointed out.

Digitized by Google

The posterior maxillipeds (fig. 4) are rather slender, though scarcely longer than the very strongly built anterior maxillipeds. The 1st basal joint is comparatively short and somewhat lamellar, carrying at the end anteriorly a short spine accompanied by a small bristle. From about the middle of the anterior edge another much larger spine, or more properly seta, of a peculiar, compact consistency originates. This seta, which is unciliated and somewhat flexuous, is comparatively longer than in the type species, and gradually tapers to a fine point. The 2nd basal joint is very slender, and carries anteriorly 5 setæ, the outer 2 issuing from a particular lobe at the junction with the terminal part. The latter is shorter than the 2nd basal joint, and is composed of 5 articulations rapidly diminishing in size, and carrying comparatively short bristles.

The legs, as in the other species of this genus, are all natatory, with both rami distinctly 3-articulate. In structure they agree, on the whole, with those in *H. spinifrons*, the terminal joint of the outer ramus in the 2nd, 3rd and 4th pairs being distinguished by its large size and foliaceous character.

The 5th pair of legs (fig. 5) are considerably smaller than the next preceding ones, and are distinguished by the strong spine issuing from inside the 2nd joint of the outer ramus. In the present species this spine is shorter than the terminal joint, is somewhat cultriform, and stands out from the joint at nearly a right angle.

The adult male (fig. 6) is a little smaller than the female, scarcely exceeding a length of 4·20 mm. It is easily recognized by its more slender form, the different structure of the tail, and the geniculate left anterior antenna. The form of the anterior division of the body is about the same as in the female, except that the last segment is more distinctly defined from the preceding one. The tail is very narrow, cylindric, and composed of 5 well-defined segments, none of which is protuberant below. The caudal rami with their setæ are exactly as in the female.

The left anterior antenna (see fig. 6) is somewhat shorter than the right, and has a very distinct geniculation at about the distal 3rd part of its length. The articulations preceding this geniculation are, however, but very slightly dilated, and the movable terminal part is quite simple, consisting of 5 slender articulations.

Digitized by Google

The posterior antennæ and oral parts are of exactly the same structure as in the female.

Of the legs, too, only the last pair (fig. 7) differ in structure from those in the female. In both legs the outer ramus is transformed, and in the right leg the basal part is also peculiarly modified, its 2nd joint sending out, inside, a falciformly curved process, finely ciliated along the inner edge, and terminating in a blunt point. The outer ramus of the right leg is somewhat larger than that of the left, and otherwise also rather unlike it. Its 1st joint is conically produced at the end outside, where it carries a short spine. The 2nd joint has no spine, but forms, inside near the base, a rounded protuberance. The last joint is fully as long as the other 2 combined, and is spoon-shaped, carrying 2 small lateral spines, and inside the tip a short bristle. The outer ramus of the left leg is generally greatly incurved, and its 2 first joints have each a well-marked spine at the end outside. The last joint is rounded lamellar, with 2 rather strong lateral spines, and terminating in a slender claw. None of these rami has any trace of natatory setæ inside. The inner ramus is essentially of the same appearance in the two legs, being 3-articulate, with the 1st joint very small and less perfectly defined. Each ramus carries 7 natatory setæ, one of which issues from the 2nd joint, the other 6 from the last.

Occurrence. This characteristic Calanoid occurred in the greater number of the samples (13), and was found as frequently in the eastern as in the western part of the basin traversed. It also occurred in the above-mentioned sample, which was taken from the very surface of the sea.

Distribution. Coast of Norway (only in depths below 100 fathoms); the North Sea.

18. *Heterochæta compacta*, n. sp.

(Pl. XXIV, XXV).

Specific Characters. ♀. Body short and compact, with the anterior division considerably tumefied and oval in form, rostral prominence much smaller than in the preceding species, with the apical filaments shorter. Tail scarcely more than 1/3 as long as the anterior division, genital segment large and dilated, caudal rami somewhat less unequal than in *H. norvegica*.

Digitized by Google

Anterior antennæ scarcely longer than the anterior division of the body, and composed of 24 articulations only. Posterior antennæ more strongly built than in the type species. Anterior maxillipeds exceedingly large and powerful, with the 2 outer spines very long and claw-like. Posterior maxillipeds scarcely as long as the anterior, 1st basal joint without any transformed seta anteriorly. Last pair of legs with the incurved spine of the outer ramus fully as long as the terminal joint, and finely denticulated in its outer part. Length of adult female 3·35 mm.

Remarks. This is a very distinct species, easily recognizable from the other known forms by its unusually robust body, and the less elongated anterior antennæ. It is, however, a true *Heterochæta*, as shown by the structure of the several appendages. Only female specimens have come under my notice.

Description of the Female.

The length of the body measures 3·35 mm., and accordingly this form is also somewhat larger than the type species, *H. spinifrons*, Claus.

The general form of the body (see Pl. XXIV, figs. 1 & 2) looks rather different from that of the preceding species, being much more robust and compact, with the tail comparatively shorter. The anterior division of the body is considerably tumefied and, viewed dorsally (fig. 1), of regular oval form, with the greatest width equal to about half the length, and occurring somewhat behind the middle. The anterior extremity appears obtusely rounded, the posterior abruptly contracted, and slightly emarginated in the middle. The rostral projection is comparatively smaller than in *H. norvegica*, and in the dorsal view of the animal (fig. 1) only causes a very slight nodiform prominence in front. It is, however, of an essentially similar form, and carries on the deflexed tip 2 straight tentacular filaments (see fig. 3). The cervical depression of the cephalic segment is clearly distinguishable in the lateral view of the animal (fig. 2). The last pedigerous segment is very small, though more distinctly defined than in the preceding species.

The tail is comparatively short and thick, scarcely exceeding 1/3 of the length of the anterior division, and has the genital segment very large and dilated, the other 3 gradually diminishing in size. The caudal rami (see fig. 4) agree in their form with those in *H. norvegica*, and, as in that species, are

Digitized by Google

somewhat asymmetrical, the left ramus being larger than the right, though the difference is not so pronounced as in the above-mentioned species. The middle apical seta of the left ramus seems in this species also to have been much prolonged; but its exact length cannot be determined, as in all the specimens examined its distal part was broken off.

The anterior antennæ (fig. 5) are not nearly so slender and elongated as in *H. norvegica*, scarcely exceeding in length the anterior division (conf. figs. 1 & 2), and they are composed of only 24 articulations.

The posterior antennæ (fig. 6), on the whole, agree in their structure with those in *H. norvegica*, though being somewhat more strongly built. The outer ramus is shorter than the inner, about equalling in length the proximal joint of the latter, and it is divided into 7 well-defined joints, 4 short articulations occurring between the 2nd and last joint. All the joints, except the 1st, carry strong plumose setæ.

The anterior lip (fig. 7) is rather prominent and distinctly trilobate at the end, the lateral lobes being densely ciliated at the edges. The posterior lip (fig. 8) exhibits the usual appearance, and consists of 2 diverging rounded lobes finely ciliated on the edges.

The mandibles (fig. 9), as in the other species of this genus, have the masticatory part peculiarly modified, with only 3 unusually slender cutting teeth. Of these the outermost is very large, claw-shaped, and provided outside with a thin lamellar expansion. The other 2 are placed close together, and are separated from the first by a wide semilunar emargination. They differ slightly in the two mandibles, both on the right being bidentate at the tip, whereas on the left (fig. 9 a), only the inner is bidentate, the outer being simple. On both mandibles a ciliated bristle is attached inside the cutting teeth. The palp is normally developed, and has the outer ramus considerably larger than the inner.

The maxillæ (fig. 10) in the present genus are rather unlike those in the typical Calanoids, chiefly on account of the peculiar development of their outer part or palp. In the present species, they agree rather closely in structure with those in *H. norvegica*, as also with those in the type species *H. spinifrons*. The masticatory lobe is rather prominent, and the spines clothing its transversely truncated end are unusually slender and densely crowded together. The vibratory plate is comparatively small, and provided

Digitized by Google

with only 4 plumose setæ. The 2 setiferous lobes usually present between the masticatory lobe and the palp, are replaced by a simple conical projection, tipped with a single seta. The basal joint of the palp is comparatively small, but well defined, and carries only a single very small seta on a conical projection of the inner edge. The inner ramus is exceedingly minute, knob-like, and carries on the tip 4 likewise small setæ. The outer ramus, on the other hand, is very powerfully developed, forming a cylindrical joint fully as long as the remaining part of the maxilla, and tipped with 5 exceedingly long plumose setæ.

The anterior maxillipeds (Pl. XXV, fig. 1) are enormously developed, considerably larger even than in the preceding species. They each form a very strong curved stem apparently composed of 5 or 6 joints of very unequal length, the 1st being, as usual, much the largest. Of the usual 5 digitiform lobes, only the outer 2 are distinctly developed, the 3 proximal ones being more or less rudimentary, the 2nd even replaced by a single very small seta. The penultimate lobe carries 2 claw-like spines and a seta, and from the tip of the very slender ultimate lobe an exceedingly long and falcate claw originates, accompanied by a very small seta. Another claw-like spine of about the same size issues from the extremity of the maxilliped, lying in close proximity to the former. All these spines exhibit along the inner concave edge a very dense ciliation (see fig. 2). In structure these maxillipeds differ conspicuously both from the type species and from *H. norvegica*, whereas they closely agree with those of *H. vipera*, as figured by Dr. Giesbrecht.

The posterior maxillipeds (fig. 3) are scarcely as long as the anterior, and are far less powerful. They resemble in structure those in *H. norvegica*, differing, however, conspicuously in the absence of the long, flexuous spine of the 1st basal joint, this spine being here replaced by quite an ordinary seta.

The legs (figs. 4—8) are also, on the whole, built upon the very same type as in that species. They are all natatory and very powerfully developed, though the 1st and last pairs are rather smaller than the 3 middle pairs. In the 1st pair (fig. 4) the difference in size between the 2 rami is less pronounced than in the other pairs, the inner ramus being scarcely shorter than the outer, but fully as broad. This ramus carries, in all, 8 natatory setæ, one on the 1st, 2 on the 2nd, and 5 on the last joint. The outer ramus has the terminal joint shorter than the other 2 combined, and provided

Digitized by Google

inside with 4 well-developed natatory setæ. At the tip, this joint carries a slender spine, and outside 2 much smaller spines, which, like those of the 2 preceding joints, terminate in a thin flexible point.

The 3 succeeding pairs (figs. 5, 6, 7) are essentially of the same structure, though successively increasing somewhat in size. They have the inner ramus scarcely more than half as long as the outer, and much narrower. Its last joint in the 2nd and 3rd pairs carries 7, in the 4th pair 8 natatory setæ, 2 of which issue from the outer edge. The outer ramus is distinguished by the large size and foliaceous character of the last joint, which, especially in the 4th pair, is developed to quite an unusual extent, considerably exceeding in size the 2 other joints combined. In all 3 pairs this joint carries 5 natatory setæ inside, 3 spines outside, and at the tip another somewhat larger spine. Both the setæ and the spines are unusually short.

The 5th pair of legs (fig. 8) differ from the next preceding ones, not only in their much smaller size, but also in some of the structural details. Thus the 1st basal joint is without the plumose seta present in all the other pairs. The inner ramus, as in the 1st pair, has only 8 natatory setæ; but of these, 6 belong to the last joint, the 2nd joint having only a single seta. The outer ramus is fully twice as long as the inner, and much stronger. In the 1st joint the natatory seta is wanting, and in the 2nd it is replaced by a strong, incurved spine, finely denticulate in its outer part, and equalling in length the last joint. The latter is about as long as the other 2 combined, and carries 4 natatory setæ inside, 2 small spines outside, and at the tip a much larger spine, as in the 3 preceding pairs, finely serrate outside.

Occurrence. Solitary specimens of this form were found in 4 different samples taken on the following dates: March 24th, 1894, between March 26th and April 4th, 1895, June 28th, 1895, November 12th, 1895. One of these samples was taken from the very surface of the sea, the others in depths of from 130 to 300 metres.

Gen. *Augaptilus*, Giesbrecht.

Remarks. This genus was established in the year 1892 by Dr. Giesbrecht, to comprise 2 Mediterranean species formerly referred by Claus to the genus *Hemicalanus*, viz *H. filigerus* and *H. longicaudatus*, and at the same time he adds 5 new species from the tropical parts of the oceans, all

Digitized by Google

taken from considerable depths. The genus is easily distinguished from *Hemicalanus*, as also from *Heterochæta*, by the tail in the female being composed of only 3 segments. Moreover the structure of the oral parts is rather peculiar, though, it would seem, subject to considerable variation in the several species. To this genus I refer a very characteristic Calanoid from the North Polar Sea, in which the reduction of some of the oral parts (mandibles and maxillæ) has reached its maximum,

19. *Augaptilus glacialis*, n. sp.

(Pl. XXVI, XXVII).

Specific Characters. Body slender and elongated, with the anterior division oblong in form, and rather narrowed anteriorly. Cephalic segment well defined, but without any distinct cervical depression, front angularly bent, and carrying below 2 slender tentacular filaments. Last pedigerous segment not defined from the penultimate one, and having the lateral corners rounded off. Tail scarcely half the length of the anterior division, genital segment in female longer than the 2 succeeding ones combined, and but slightly dilated in front. Caudal rami slender and elongated, perfectly symmetrical, each with 5 strong, plumose setæ, the outermost of which originates at some distance from the others. Anterior antennæ very slender and elongated, considerably exceeding in length the whole body, and composed of 25 articulations, penultimate and antepenultimate joints each with a densely plumose seta behind; left antenna in male prehensile, antepenultimate joint produced at the end to a slender spiniform process. Posterior antennæ with the 2nd basal joint narrowly produced at the inner corner, outer ramus somewhat longer than the inner. Mandibles with the masticatory part narrowly produced, cutting teeth only 3 in number, palp very small, forming a simple cylindrical joint with 2 unequal setæ at the tip. Maxillæ rather imperfectly developed, with only a slight rudiment of the masticatory lobe, vibratory lamella likewise very small, with only 2 setæ, the one exceedingly prolonged; palp simple, cylindric, with 2 long apical setæ. Anterior maxillipeds well developed, with the digitiform lobes small and widely apart; none of the setæ claw-shaped. Posterior maxillipeds very slender, and of normal structure. Legs built upon a similar type to that in *Heterochæta*, but comparatively less powerful,

Digitized by Google

apical spine of outer ramus in the 3 middle pairs rather slender, and slightly incurved. Last pair of legs, as in *Heterochæta*, with a strong spine inside the 2nd joint of the outer ramus; outer rami of the two legs in male not very dissimilar in size and structure, though rather unlike those in female. Length of adult female 4.82 mm.

Remarks. This is a very conspicuous Calanoid, easily recognizable from the other polar forms. Of the species recorded by Dr. Giesbrecht, *A. longicaudatus* (Claus) seems to approach nearest to the polar species, at least as regards the structure of the oral parts. It is, however, rather inferior in size, and seems also to differ in some of the structural details. In any case, it can hardly be supposed that the present species is identical with any of the hitherto recorded species, all of which have quite a southern distribution.

Description of the Female.

The length of the body in adult specimens is 4·82 mm., and this form is accordingly of rather large size, in this respect about equalling the Mediterranean species *A. filigerus*, Claus, but considerably exceeding its nearest ally, *A. longicaudatus*, the length of which is stated by Dr. Giesbrecht to be only from 3·70 to 3·85 mm.

The general form of the body (see Pl. XXVI, figs. 1 & 2) somewhat recalls that in *Heterochæta norvegica*, but is rather more slender. The anterior division is but very slightly vaulted above (see fig. 2), and, seen dorsally (fig. 1), exhibits a narrow oblong form, with the greatest width somewhat behind the middle, and not attaining even 1/3 of the length. The anterior extremity appears narrowly rounded and somewhat abruptly constricted behind, the posterior but very slightly emarginated in the middle. The cephalic segment is well defined from the 1st pedigerous one, and not quite as long as the remaining segments combined. It does not exhibit any distinct cervical depression, and the front, seen laterally (fig. 2), is rather narrow and angularly bent, projecting below in a small bifurcate rostrum, which carries 2 delicate tentacular filaments (see Pl. XXVII, fig. 1). The last pedigerous segment is wholly coalesced with the preceding one, and has the lateral corners evenly rounded off.

The tail is rather slender, though not quite attaining half the length of the anterior division. It is only composed of 3 segments, the 1st of which,

Digitized by Google

the genital segment, exceeds in length the other 2 combined, and is but slightly dilated in its anterior part. The last segment (see Pl. XXVII, fig. 11) is a little longer than the preceding one, and is rather obliquely truncated on each side at the junction with the caudal rami. The latter (ibid.) are perfectly symmetrical and produced to an unusual degree, being about the length of the last 2 segments combined, and are linear in form, pointing straight behind. They each carry 5 densely plumose setæ, 3 of which issue from the narrowly rounded tip, the other 2 from distinct ledges of the outer edge. One of the latter is placed at rather a long distance from the other, in front of the middle of the outer edge. The middle apical seta, or the innermost but one, is much longer than the others, and terminates in a very slender filament, curved outwards (see Pl. XXVI, fig. 1). Moreover, as in most other Calanoids, a very slender and delicate, unciliated bristle originates from the upper face of each ramus, close to the inner corner.

No trace of any eye could be detected in the preserved specimens.

The anterior antennæ (see Pl. XXVI, figs. 1, 2) are exceedingly slender and elongated, the 5 distal joints projecting, when reflexed, beyond the tips of the caudal rami. They are composed of 25 well-defined articulations, which are clothed anteriorly with delicate bristles. The penultimate and antepenultimate articulations each carry, moreover, at the end posteriorly, a remarkably large and densely plumose seta (see Pl. XXVII, fig. 2).

The posterior antennæ are very greatly developed, projecting far from the sides of the body (see Pl. XXVI, fig. 1). In structure, they exhibit several peculiarities (see Pl. XXVII, fig. 3). Thus the basal part is rather slender and quite naked, without any trace of the usual plumose setæ in front, and it is, moreover, considerably produced at the inner corner, so that the 2 rami issue at some distance from one another. At the insertion of the inner ramus, it projects to a small triangular lappet, at the base of which a small hair is attached. The inner ramus, which generally forms, with the basal part, a geniculate bend, consists, as usual, of 2 joints, the 1st of which is the larger, and is densely ciliated along the somewhat convex hind edge, but without any setæ anteriorly. The last joint is oblong oval in form, and slightly bilobular at the tip, carrying about 10 setæ, some of which are exceedingly long and slender. The outer ramus is a little longer than the inner, is cylindrical in form, and composed of only 5 joints, the 1st of which is imper-

Digitized by Google

fectly defined from the basal part. The 2nd joint is much the largest, exceeding in length the succeeding joints combined, and carries 2 setæ inside, one rather short, somewhat beyond the middle, and another much longer, at the end. The 2 very short succeeding joints carry each a seta, but that issuing from the outer joint is so very small, that it may easily escape attention. From the tip of the last joint, 3 exceedingly long and slender setæ originate.

The mandibles (fig. 4) are very small, and have the masticatory part narrowly produced, almost cylindric in form, and much longer than the other part. The cutting teeth are only 3 in number, the outermost tooth being the largest, and somewhat remote from the other 2. The palp is more rudimentary than in any other known Calanoid, consisting only of a simple cylindric joint tipped with 2 unequal setæ, and scarcely more than half the length of the body of the mandible.

The maxillæ (fig. 5) are likewise very much reduced, and rather unlike those in other Calanoids, each forming a simple narrow lamella, projecting on each side in a small setiferous lobe. The inner of these, which occurs close to the base, may answer to the masticatory lobe. It is very small, knob-like, and carries 2 unequal setæ of inconsiderable size. The outer lobe, which issues rather more distally, seems to represent the vibratory lamella. It is likewise very small, but carries 2 very strong setæ, the inner of which is prolonged to quite an extraordinary degree, being more than 3 times as long as the whole maxilla. The distal part, which answers to the palp, is narrow cylindric in form, and carries on the tip 2 strong setæ of equal length.

The anterior maxillipeds (fig. 6) are well developed, though not nearly so powerful as in *Heterochæta*, each forming a very slightly curved stem, divided into 5 joints, the 2 proximal ones being much the largest, and together representing the basal part. The 5 digitiform lobes of the anterior edge are comparatively small, and are distinctly separated from each other, the 2 proximal and the distal one each carrying a single coarsely ciliated seta, whereas the other 2 have each 2 such setæ. The setæ issuing from the 3 small terminal joints are rather slender and elongated, and, when examined under a very high magnifying power, are found to be thickly fringed along

Digitized by Google

Occurrence. This remarkable Calanoid was found in 7 different samples taken on the following dates: March 22nd, 1894, March 24th, 1894, April 11th, 1894, May 22nd, 1894, between March 26th and April 4th, 1895, May 7th, 1895, and November 12th, 1895, the tow-net having been lowered to depths of from 100 to 300 metres. One of the samples was taken near the most northerly point reached by the 'Fram'.

Gen. *Hemicalanus*, Claus.

Remarks. The generic name *Hemicalanus* was originally proposed by Dana in the year 1852; but as all the species included by him in that genus have proved to be referable to two previously established genera, viz., *Calanus* and *Centropages*, this name ought more properly to have been wholly discarded. Prof. Claus, however, in the year 1863, employed the same name in a different sense, to comprise 5 Mediterranean species, 2 of which were subsequently removed by Dr. Giesbrecht, and referred to the nearly-allied genus *Augaptilus*. To the 3 remaining species of Claus, now generally admitted to be genuine *Hemicalani*, 2 species were added by Brady from the Challenger Expedition, and Dr. Giesbrecht records 6 new species, 4 of which were found in the Gulf of Naples, the other 2 in the tropical part of the Pacific. None of these 11 species have ever been found north of the Mediterranean, and it has accordingly been generally assumed that the present genus is quite southern in distribution. It was therefore not a little surprising to find a specimen, undoubtedly belonging to this genus, in a sample taken from about the centre of the polar basin traversed by the 'Fram'. The specimen was in a sufficiently good state of preservation to allow of a close examination, both as to the external appearance and the anatomical details, and, as it may be of considerable interest to determine the relation in which this form stands to the other known species, I have given on Pl. XXVIII, figures, as exact as possible, both of the whole animal and the chief appendages. Not having been able to identify it with any of the previously known forms, I describe it here provisionally as a new species.

Digitized by Google

also mentioned by Dr. Giesbrecht as occurring in the species examined by him, was at first overlooked, owing to its being partly concealed by the outer ramus, and it is not indicated in the figure here given. The outer ramus is fully twice as long as the inner, and much broader. The natatory seta of the 1st joint is wanting, and in the 2nd joint it is replaced, as in *Heterochæta*, by a strong denticulated spine, which in the present form is somewhat deflexed and a little shorter than the terminal joint. The latter is considerably larger than the other 2 joints combined, and is of oblong oval form, carrying 4 short natatory setæ inside, 2 extremely small spines outside, and at the tip another very short and blunt spine. The inner ramus is of the same structure as in *Heterochæta*, except that its terminal joint is comparatively larger, being fully as long as the other 2 combined.

The adult male (Pl. XXVI, fig. 3) resembles the female in its general habitus, but is easily recognizable by the structure of the left anterior antenna, the last pair of legs, and the tail. The latter is very slender, cylindric, and composed of 5 well-defined segments, which do not greatly differ in size. The caudal rami with their setæ are exactly as in the female.

The left anterior antenna (see fig. 3) is somewhat shorter than the right, scarcely reaching, when reflexed, beyond the caudal rami. It is distinctly geniculate at about the distal third part of its length, the 6 or 7 articulations preceding the geniculation being somewhat dilated, and containing the usual muscular band acting upon the terminal part. The latter (see fig. 4) is composed of 4 articulations, the 1st of which is the largest. The 2nd articulation is about the length of the last 2 combined, and is produced at the end anteriorly to a long styliform process, extending almost to the end of the last articulation.

The posterior antennæ, oral parts, and the 4 anterior pairs of legs do not exhibit any perceptible difference in their structure from those appendages in the female.

The last pair of legs (Pl. XXVII, fig. 10), however, are somewhat different, especially as regards the outer ramus, which is more robust, and has no spine inside the 2nd joint, nor yet natatory setæ. This ramus moreover, is slightly dissimilar on the two legs, as shown by the figure here given; but the dissimilarity is far from being so conspicuous as in *Heterochæta*.

Digitized by Google

guments, on viewing the animal from the dorsal side (see fig. 1). The general form of the body is that characteristic of the present genus, being especially distinguished from that in the nearly-allied genus *Augaptilus* by the unusually small size of the tail, as compared with the anterior division. The latter, seen dorsally, is of a rather regular oblong oval form, with the greatest width occurring somewhat in front of the middle, and not attaining 1/3 of the length. It is composed of the same number of segments as in *Augaptilus*, the 1st, or cephalic segment being well defined, whereas the last 2 pedigerous segments are completely coalesced. The cephalic segment occupies rather more than half this division, and is prolonged in front to a very conspicuous, narrow spiniform projection, extending far beyond the insertions of the anterior antennæ, and carrying on the tip a very minute hair (see fig. 2). The lateral corners of the last segment are not at all produced, but are evenly rounded off.

The tail, as stated above, is of very small size, and, including the caudal rami, does not even exceed 1/6 of the length of the anterior division. It consists (see fig. 12) of 4 well-defined segments, the 1st of which, the genital segment, is larger than the other 3 combined, and considerably dilated in the middle. The anal segment is a little larger than the preceding one, and is somewhat obliquely truncated on each side at the junction with the caudal rami. The latter are about twice as long as they are broad, are pronouncedly laminar, and scarcely at all divergent, the broadly truncated ends even being somewhat incurved. The 5 caudal setæ belonging to each ramus all seem to be of the same structure, and are clothed with cilia of the usual kind. 4 of them issue close together from the tip, the 5th from a distinct ledge of the outer edge. A small unciliated bristle is also attached to the inner corner of each ramus.

No trace of any eye could be detected.

The anterior antennæ (see fig. 1) are considerably longer than the whole body, and are rather thick at the base, though gradually attenuated distally. They are composed of the full number of articulations (25), and are clothed anteriorly with slender bristles, some of which are rather elongated.

The posterior antennæ (fig. 3) have the 2nd basal joint more than twice as long as the 1st, both carrying at the end anteriorly a single very small seta. The inner ramus is very long and slender, with the proximal joint

Digitized by Google

narrow cylindric and unarmed, the last, as usual, unequally bilobed, and carrying on the tip 10 slender setæ arranged in a flabelliform manner. The outer ramus is comparatively small, scarcely more than half as long as the inner, and is attached to the basal part far from its extremity. It is composed of only 5 distinctly defined joints, the 1st of which is nearly as long as the other 4 combined, the last about half as long. On the tip, this ramus carries 3 very much elongated setæ, and along the inner side 5 much shorter setæ.

The mandibles (fig. 3. bis) are rather feeble, with the masticatory part narrowly produced, and terminating in only 2 unguiform cutting teeth. The palp exhibits all the chief parts distinctly developed, and is considerably larger than the body of the mandible. Its basal part, however, is rather narrow and quite naked, being obliquely produced at the inner corner, so that the inner ramus projects considerably beyond the outer. The 1st joint of the inner ramus is imperfectly defined from the basal part, and carries 2 setæ inside; the last joint is provided at the tip with 6 slender setæ arranged in a flabelliform manner. The outer ramus exhibits the usual structure, being divided into 5 articulations, carrying long plumose setæ.

The maxillæ (fig. 6) have likewise all the chief parts distinctly developed. The masticatory lobe is rather narrow, and carries a limited number of ciliated spines. The vibratory plate is well developed, and provided with 6 densely plumose setæ. Between the masticatory lobe and the palp, a small lobe carrying a single seta occurs. The basal part of the palp is provided inside with 4 setæ, of which the proximal one issues at some distance from the others, being attached to a small knob-like projection, which may answer to the 2nd intermediate lobe. The 2 rami are both well defined from the basal part, but are of very different size, the inner one being very small, and provided with only 3 apical setæ, whereas the outer is unusually large, forming a subcylindric piece projecting far beyond the inner ramus, and carrying on the somewhat dilated and obliquely truncated extremity about 6 setæ, the 2 innermost of which are very much prolonged and densely plumose in their distal part.

The anterior maxillipeds (fig. 7) somewhat resemble those in *Augaptilus*, as described above, but differ in the fact of the basal part being divided into 3 distinctly defined joints of about equal size. The 5 digitiform lobes are

Digitized by Google

comparatively small and separated by distinct interspaces, 2 of them issuing from the 1st basal joint, 2 others from the 2nd, and the 5th from the 3rd basal joint. The lobes carry each 2 ciliated setæ of moderate length, except the proximal one, which has 3 such setæ. One of the setæ of the 5th lobe is rather strong and spiniform. A 6th lobe, carrying 3 setæ, is formed by the 1st joint of the terminal part, the 2 other joints being provided with a number of more claw-like spines.

The posterior maxillipeds (fig. 8) are rather powerful, with the 1st basal joint considerably larger than the 2nd, and the terminal part very fully developed, consisting of 5 well-defined joints carrying claw-like, anteriorly curving spines.

The legs (figs. 9, 10, 11) are all natatory, and in structure resemble, on the whole, those in the genus *Augaptilus*, though comparatively less powerful. The 1st pair (fig. 9) have the basal part bent in a peculiar manner, so that these legs extend more laterally than the other pairs. The 1st basal joint exhibits outside a very conspicuous rounded protuberance, and the 2nd has, at the outer corner, a slender bristle not found in the other pairs. The rami closely agree in structure with those in *Augaptilus glacialis*, and have the very same number of spines and setæ. The 3 succeeding pairs (fig. 10) likewise exhibit much the same structure as in the above-mentioned form, except that the apical spine of the outer ramus is comparatively smaller. The last pair of legs (fig. 11) are scarcely different in structure from the next preceding ones. They are, however, as usual, somewhat smaller, and the terminal joint of the outer ramus has only 3 natatory setæ instead of 5, and 2 spines outside, instead of 3. On the other hand, each of the 2 preceding joints has a perfectly normal natatory seta, and the 1st basal joint also has its usual plumose seta inside. The inner ramus is scarcely half as long as the outer, and its 2nd joint has only a single natatory seta.

Occurrence. The above-described specimen was found in a sample taken between March 26th and April 4th, 1895, about midway along the route of the 'Fram', and in about the 84th degree of latitude, the tow-net having been lowered to a depth of 130 metres.

Digitized by Google

Fam. TEMORIDÆ.

Gên. *Metridia*, Boeck.

Remarks. This genus, established in the year 1864 by Boeck, is very nearly allied to *Pleuromma* of Claus, the chief difference being the absence of the lateral eye (luminous organ?). Boeck records 2 species of this genus from the Norwegian coast, viz., *M. armata* and *M. lucens;* but both these forms were very insufficiently characterised. The first-named species has subsequently been identified by Dr. Giesbrecht with *Calanus longus* of Lubbock, whereas the 2nd species has not been recognized. I believe, however, that it is the same species as that subsequently described by Brady and Robertson as *M. hibernica.* To these 2 species Dr. Giesbrecht has added 6 new species, one from the Farõe channel, the others from the tropical parts of the oceans. In the samples brought home from the Nansen Expedition, one species of this genus occurred in great abundance.

21. *Metridia longa* (Lubbock).
(Pl. XXIX).

Syn: *Metridia armata*, Boeck.

Remarks. I think that Dr. Giesbrecht is quite right in identifying Boeck's species with *Calanus longus* of Lubbock, and as the specific name proposed by Lubbock is the older one, the species ought hereafter to be termed as above. The occurrence of this form in the Arctic Ocean has been already stated by several authors, and the species may therefore be sufficiently well known, for which reason I think any detailed description of it can be dispensed with. As, however, no good illustrations of it exist, I give on the accompanying plate exact figures of both sexes, together with some details, all figures drawn from specimens procured during the Nansen Expedition. The average length of adult females is 4·30 mm., or about the same as that of Norwegian specimens.

Occurrence. This form occurred rather abundantly in the greater number of the samples (14), and was taken both from the surface of the sea and down to a depth of 300 metres.

Distribution. Coast of Norway, very abundant in the great depths of the fjords, below 100 fathoms, Arctic Ocean, Spitsbergen, the Kara Sea.

Digitized by Google

Gen. *Temorites*, n.

Generic Characters. Form of body short and robust. Cephalic segment well defined, last pedigerous segment confluent with the penultimate one. Front without any rostrum or tentacular appendages. Tail symmetrical, and composed in female of 4, in male of 5 segments. Caudal rami very small, with a limited number of setæ. Anterior antennæ 24-articulate; right antenna in male prehensile. Posterior antennæ with the outer ramus 7-articulate, and about the length of the inner. Mandibles well developed, cutting teeth rather dissimilar, the outer ones unguiform, palp comparatively large, with the inner ramus the more prominent. Maxillæ with the palp imperfectly developed, inner ramus obsolete, outer not defined from the basal part, lamelliform, with strong curved setæ. Anterior maxillipeds exceedingly large and powerful, with the distal spines very much elongated and claw-shaped. Posterior maxillipeds normal. 1st pair of legs rather small, with the inner ramus biarticulate; the 3 succeeding pairs well developed, with both rami 3-articulate, the outer one very strong. Last pair of legs in both sexes simple, not biramous, in female 3-articulate, with the terminal joint long and narrow, spiniferous at the tip; right leg in male much larger than left, with the 3rd joint lamellarly expanded, and carrying at the tip a strong, incurved claw; left leg tapered distally, and carrying a straight apical spine.

Remarks. This new genus is only provisionally placed in the family *Temoridæ*. It differs, in fact, very materially in some respects from the other known genera comprised in this family, and in certain points exhibits an apparent approach to the *Pontellidæ*. The genus comprises as yet but a single species, to be described below.

22. *Temorites brevis*, n. sp.

(Pl. XXX, XXXI).

Specific Characters. Body in both sexes very short and stout, with the anterior division considerably tumefied, and oval in form. Tail scarcely exceeding 1/3 of the length of the anterior division, and having the segments very sharply marked off from each other, anal segment smaller than the others. Caudal rami of very small size, each with only 3 plumose setæ, and an unciliated bristle at the inner corner. Anterior antennæ about the length

Digitized by Google

of the anterior division of the body, and rather densely setiferous, especially in their proximal part; right prehensile antenna in male with the dilated part, preceding the geniculation, composed of only 4 articulations, the last of which has anteriorly a deep, semilunar emargination defined by 2 spiniform projections, of which the proximal is rather strong, terminal part rather longer and 5-articulate, 1st joint fusiform, and projecting at the end anteriorly to a small hamiform prominence. 3rd and 4th pairs of legs with a deflexed spine at the outer corner of the 2nd basal joint, especially large in the 3rd pair, apical spine of outer ramus very strong and coarsely denticulate outside. Last pair of legs in female with the terminal joint almost twice the length of the other 2 combined, narrow linear in form, and carrying at the tip 2 unequal spines, the inner one the larger and somewhat incurved. Right leg of this pair in male with the 3rd joint irregularly oval in form, exhibiting outside 2 angular prominences, terminal claw abruptly curved in its outer part and carrying at some distance from the base a small spine; left leg likewise with a small spine outside the terminal spine. Length of adult female 1·10 mm., of male 1·05 mm.

Remarks. This form, at first sight, somewhat resembles the above-described new species of *Heterochæta* (H. compacta), exhibiting a similar short and compact form of body. It is, however, in reality very different as regards the structural details, and is also of very inferior size.

Description of the Female.

The length of the body in fully grown specimens does not exceed 1·10 mm., and this form is accordingly of rather small size.

The general form of the body (see Pl. XXX, figs. 1 & 2) is very short and stout, so far greatly contrasting with the preceding species, *Metridia longa,* which is one of the most slender of known Calanoids. The anterior division is rather tumid and, seen dorsally (fig. 1), exhibits a rather regular oval form, with the greatest width almost equalling half the length, and occurring in the middle. The anterior extremity appears obtusely rounded, and the posterior is of about the same width, and slightly emarginated in the middle, with the lateral corners rounded off. The cephalic segment is well defined, whereas the last 2 pedigerous segments are imperfectly separated.

Digitized by Google

The front is not produced below to any rostral prominence, nor is the slightest trace of any tentacular filaments to be detected.

The tail (fig. 7) is comparatively short, scarcely exceeding in length 1/3 of the anterior division, and is divided into 4 segments, which are very sharply marked off from each other. The 1st, or genital segment, as usual, is the largest, though shorter than the 2 succeeding ones combined, and is but slightly protuberant below. The last, or anal segment is both shorter and narrower than the others, and is somewhat obliquely truncated on each side at the junction with the caudal rami. The latter are very small, lamelliform, and each carry only 3 plumose setæ, 2 of which issue from the tip, the 3rd from a distinct ledge of the outer edge. Of these setæ the middle one is the longest, and the innermost the shortest. In addition, the usual unciliated bristle occurs at the inner corner of each ramus.

No trace of any eye could be detected in the preserved specimens.

The anterior antennæ (fig. 4) are scarcely longer than the anterior division of the body, and are composed of 24 articulations, the last of which, however, is so very small, as easily to be overlooked. They are rather thickly clothed anteriorly with delicate bristles, especially in their proximal part.

The posterior antennæ (Pl. XXXI, fig. 1) are normally developed. The basal part is rather thick, and has at the end of the 1st joint a comparatively short ciliated setæ, at the end of the 2nd joint 2 much longer setæ. The inner ramus is about twice the length of the basal part, with the proximal joint somewhat compressed, and provided at some distance from the end anteriorly with a short seta. The distal joint, as usual, is lamelliform and unequally bilobed, carrying about 12 slender setæ arranged in a flabelliform manner. The outer ramus is about the length of the inner, and is divided into 7 well-defined articulations. Of these the 1st is somewhat larger than the 2nd, with which it is connected along a very oblique suture, and projects at the base anteriorly as a rounded protuberance. The 4 succeeding joints are very small, and combined are scarcely as long as the terminal joint. This ramus carries 3 apical and 5 lateral setæ.

The anterior and posterior lips (Pl. XXX, fig. 6) exhibit quite a normal appearance.

The mandibles (Pl. XXXI, fig. 2) are well developed, with the masticatory part somewhat expanded, and divided at the end into several teeth. These

Digitized by Google

are rather dissimilar, some being bidentate at the tip, some simple, and some hair-like. The outermost tooth is the largest, is unguiform, and separated from the others by a deep incision. The palp is rather large, with the basal part comparatively broad and somewhat produced at the inner corner, carrying, inside, 3 ciliated setæ. The inner ramus is well defined at the base, and projects somewhat beyond the outer, which is quite normally developed.

The maxillæ (fig. 3) differ somewhat in their structure from that usually met with, especially as regards their distal part or the palp. The masticatory lobe is well developed, and is armed with about 8 ciliated spines. The opposite vibratory plate is likewise distinct, carrying 4 long plumose setæ. The distal part of the maxilla is rather produced, and terminates in a broadly rounded lamella edged with 9 remarkably strong and curved plumose setæ. This lamella no doubt represents the outer ramus; it is, however, not at all defined at the base. Between this lamella and the masticatory lobe, the inner edge exhibits 3 successive conical projections, each tipped with a single plumose seta. The outermost of these projections, which is somewhat remote from the other 2, may answer to the inner ramus, the other 2 to the setiferous lobules found in most Calanoids between the masticatory lobe and the palp.

The anterior maxillipeds (fig. 4) are very powerfully developed, somewhat recalling those in the *Pontellidæ*. The digitiform lobes of the anterior edge are rather unequal in size, and only 4 in number, the 2 proximal ones being wholly confluent. The setæ springing from these lobes are also rather unequal, rapidly increasing in size distally, one of the 3 belonging to the outermost lobe being very much prolonged and claw-shaped. A similar character is also exhibited by 4 of the spines issuing from the short terminal part. All these claw-like spines are abruptly curved in their distal part and finely denticulate along the concave edge, their length being almost twice that of the stem of the maxilliped.

The posterior maxillipeds (fig. 5) are far less robust, and, on the whole, are built upon the same type as in the other *Temoridæ*, the 2 basal joints being somewhat lamellarly expanded, and the terminal part very flexible, composed of 5 well-defined articulations clothed with slender setæ.

Of the legs, only the 4 anterior pairs are natatory, the 5th pair being very different.

Digitized by Google

The 1st pair of legs (fig. 7) are comparatively small, and also differ in other respects from the 3 succeeding pairs. The 1st basal joint has its usual plumose seta inside, and at the inner corner of the 2nd basal joint another deflexed seta occurs, not found in the other pairs. The outer ramus is somewhat longer than the basal part, and has the first 2 joints rather broad, each carrying inside a natatory seta, but without any trace of spines outside. The last joint is somewhat shorter than the other 2 combined, and is rather narrower, having likewise the outer edge unarmed; it carries 4 natatory setæ inside, and at the tip a slender spine, outside which another much smaller spine is attached. The inner ramus is scarcely more than half as long as the outer, and is composed of only 2 joints, the last of which is the larger. It carries 5 natatory setæ, none of which issue from the outer edge.

The 3 succeeding pairs (figs. 8, 9, 10) are essentially of similar structure, and much larger than the 1st, with both rami distinctly 3-articulate, and the outer one very strongly developed, being more than twice as large as the inner. In all the 3 pairs the terminal joint of this ramus is longer than the other 2 combined, and is armed outside with 3 short spines, inside with 5 natatory setæ, and at the tip with a long spine coarsely denticulate outside. The inner ramus has likewise the last joint considerably larger than the others, and in all 3 pairs carries 10 natatory setæ, 2 of which issue outside the last joint. On a closer comparison, however, some minor differences are found to exist between these 3 pairs. Thus in the 2nd pair (fig. 8), the natatory seta of the 1st joint of the outer ramus is replaced by a short spine, and in the 3rd pair (fig. 9) a very strong deflexed spine occurs at the outer corner of the 2nd basal joint, not found in the 2nd pair. In the 4th pair (fig. 10) a similar, but much shorter spine is present, whereas the 1st basal joint is without the usual plumose seta inside.

The last pair of legs (fig. 11) are very different from the others, each forming a simple stem composed of 3 joints, of which the first 2 represent the basal part, the 3rd the outer ramus. The latter is very slender and elongated, almost twice as long as the other 2 combined, and linear in form, carrying at the tip 2 unequal spines, the inner one the longer and somewhat incurved. Otherwise these legs are quite naked.

The adult male (Pl. XXX, fig. 3) is somewhat smaller than the female, scarcely exceeding a length of 1·05 mm.

Digitized by Google

It is not very unlike the female, as regards the general form of the body, though easily recognizable by the structure of the right anterior antenna, the last pair of legs, and the tail. The latter is comparatively narrower and more regularly cylindrical in form than in the female, and is divided into 5 well-defined segments, none of which distinguishes itself by any considerable size.

The right anterior antenna (see figs. 3, 5) is very distinctly geniculate at about the distal 3rd part of its length, and has the 4 articulations preceding the geniculation rather dilated, and containing a strong muscle acting upon the terminal part. Of these articulations, the last is distinguished by a very conspicuous semilunar emargination of the anterior edge, defined proximally by a very strong spiniform process, and distally by another process of smaller size. The terminal part is considerably longer than the dilated portion, and is composed of 5 articulations, the 1st of which is the largest, and somewhat fusiform in shape, projecting at the end anteriorly in a small hamiform prominence.

The posterior antennæ, oral parts, and natatory legs exactly agree in their structure with those appendages in the female.

The last pair of legs (Pl. XXXI, fig. 12), on the other hand, are rather different, and, as usual, transformed into a prehensile apparatus, subservient to copulation. The 2 legs are rather unequally developed, the right being much the stronger. In both legs a biarticulate basal part can be distinguished, and a terminal part answering to the outer ramus, and consisting of 2 pieces, movably connected with each other, the distal one more properly representing 2 firmly connected articulations. Not the slightest trace of an inner ramus can be detected in either of the two legs. The proximal piece of the terminal part in the right leg is very large, lamellarly expanded, and of an irregular oval form, with 2 angular prominences outside, and containing a strong muscle, acting upon the distal piece. The latter is transformed into a powerful incurved claw, carrying, at some distance from the base, a small spine. On the left leg, the proximal piece of the terminal part is scarcely longer than the basal part, and not at all dilated, the inner edge being slightly insinuated in the middle, and clothed with delicate cilia. The distal piece is of about the same length as the proximal one, and terminates in a straight, denticulated spine, outside which a much smaller spine is attached.

Digitized by Google

Occurrence. This form was found in 7 of the samples, taken on the following dates: March 22nd, 1894, between March 26th and April 4th, 1894, May 22nd, 1894, May 7th, 1895, June 25th, 1895, July 30th, 1895, November 12th, 1895. One of these samples was taken from the surface of the sea, the others from depths between 100 and 200 metres.

Fam. ACARTIIDÆ.[1]

23. *Acartia longiremis*, (Lilljeborg).

Some few specimens of this well-known form were found in a sample taken October 13th, 1893, north of the New Siberian Islands.

Distribution. Norwegian coast, Kattegat, the Baltic, Bay of Kiel, British Isles, coast of France.

CYCLOPOIDA.

Tribe: ISOKERANDRIA.

Fam. ONCÆIDÆ.

Gen. *Oncæa*, Philippi.

Syn: *Antaria*, Dana.

Remarks. This genus was established by Philippi as early as in the year 1843, to include a peculiar Cyclopoid Copepod from the Mediterranean, *O. venusta*, Phil. Another species, *O. mediterranea*, was subsequently added by Claus, and Dr. Giesbrecht records no less than 8 additional species, some from the Mediterranean, some from the tropical parts of the oceans. I myself, many years ago, observed a species off the south coast of Norway, and this form has turned out to be identical with one of the Mediterranean species described by Dr. Giesbrecht as *O. conifera*. In some samples taken in the most easterly part of the polar basin traversed by the 'Fram', 2 species of this genus were found in great abundance. One of these is iden-

---

[1] The corresponding subfamily is termed by Dr. Giesbrecht *Parapontellina;* but as *Acartia* is of much older date than *Parapontella*, the family ought more properly to be named from that genus.

Digitized by Google

tical with the species formerly observed off the Norwegian coast, and the other is indistinguishable from a species recently described by Dr. Giesbrecht from great depths of the Pacific Ocean. The latter species will be described more in detail below. It may be here noted, that a species of this genus has been recorded (1875) by Prof. Lilljeborg from Mossel Bay in Spitsbergen, and by Mr. Bourne (1885) from Plymouth, in both cases determined as *O. mediterranea*, Claus.

24. *Oncæa notopus*, Giesbrecht.

(Pl. XXXII, figs. 1—14).

Oncæa notopus, Giesbrecht, Fauna und Flora des Golfes von Neapel: Pelagische Copepoden, p. 600, etc., Pl. 47, figs. 12, 15, 45.

Specific Characters. Body comparatively robust, with the anterior division rather tumid, oblong oval in form, greatest width about equalling half the length, and occurring in front of the middle, anterior extremity narrowly rounded. Tail not attaining half the length of the anterior division, genital segment longer than the remaining part. Caudal rami short, not nearly twice as long as they are broad, innermost apical seta longer than the outermost. Anterior antennæ with the proximal joints rather broad and compressed, 3rd joint about the length of the 2 preceding ones combined. Posterior antennæ with the terminal joint comparatively short, scarcely more than half the length of the penultimate one, and having the 2 groups of anteriorly-curving setæ close together. Posterior maxillipeds comparatively strong, dactylus shorter than the palm, and coarsely denticulate inside, the 2 palmar spines likewise spinulose and rather strong. Last pair of legs forming each a slender cylindric piece, carrying 2 subequal spines on the tip, and extended obliquely upwards. Length of adult female 0·70 mm.

Remarks. Neither in the 3 figures given by Dr. Giesbrecht (body of female in outline, seen from the side and from above, and the left posterior maxilliped), nor in his descriptive notes, can I find any point of difference whatever between his species *O. notopus* and the polar form here in question, and I am therefore induced to believe that these two forms are in fact identical, in spite of their widely remote occurrence. The most conspicuous specific character is undoubtedly the peculiar structure of the last pair of legs, which is exactly the same in the 2 forms.

Digitized by Google

Description of the Female.

The average length of the body in fully adult specimens is 0·70 mm. Dr. Giesbrecht, on the other hand, gives the length as 0·95 mm., and this difference in size might perhaps give rise to some doubt about the identity of the 2 forms. As, however, in the next species also, the length given by Dr. Giesbrecht considerably exceeds that of polar specimens, and, moreover, Dr. Giesbrecht himself has proved, in the case of some other species, rather a wide range of variation in this respect, no great stress can, in my opinion, be laid upon this difference.

The general form of the body (see figs. 1 & 2), as compared with that of the other known species, is rather short and robust, subpyriform. The anterior division is somewhat tumefied and, seen dorsally (fig. 1), of oblong oval form, with the greatest width equal to about half the length, and occurring rather in front of the middle. It is composed of 6 well-defined segments, the 1st of which is much the largest, exceeding in length the 2 succeeding ones combined, whereas the last segment is extremely small and sharply marked off from the others, being, as in other *Cyclopoida*, very movably connected with the preceding one, so that it has more the appearance of belonging to the posterior than to the anterior division. The cephalic segment is evenly rounded anteriorly, and projects in front in a small deflexed rostral prominence, behind which the lower edges of the segment form on each side a perfectly even curve.

The tail (see fig. 4) is scarcely half as long as the anterior division, and is much narrower, sub-cylindric in form. It is composed of 4 segments, the 1st of which, the genital segment, is much larger than all the others combined. This segment is gradually somewhat dilated in front, and, unlike what is generally the case, has the 2 genital orifices on the dorsal side. In a few specimens, the 2 ovisacs were still adhering to them, each containing a very limited number of ova, generally only 4. The anal segment is a little larger than the next preceding one, and exhibits at the end dorsally a quadrangular, thin-skinned area, containing the anal orifice. The caudal rami are rather small, not nearly twice as long as they are broad, and are separated in the middle by a distinct interspace. Each ramus carries 5 setæ, 4 of which issue close together from the transversely truncated tip, the 5th from

Digitized by Google

a ledge of the outer edge, rather in front of the middle. The latter seta is very small, and this is also the case with the outermost of the apical setæ. The innermost seta is about twice as long, and distinctly ciliated, like the 2 middle ones. The latter are much longer than the others, though somewhat unequal, the inner one being considerably longer than the outer, and somewhat exceeding half the length of the tail. Moreover, from the dorsal face of each ramus an extremely delicate bristle arises, not indicated in the figure.

No trace of eyes is to be detected, and, indeed, the total absence of these organs is a character common to all the species of this genus.

The anterior antennæ (fig. 3) are shorter than the cephalic segment, and are angularly bent at the base. They are composed of only 6 articulations, the 3 proximal ones constituting a basal division, the 3 distal ones a well-defined terminal part. The 3 joints of the basal division are somewhat dilated and compressed, but rather unequal in size. The 1st joint is constricted at the base, gradually widening distally, and carries at the end anteriorly 2 slender bristles. The 2nd joint is larger than the 1st, with which it forms a geniculate bend. It carries 4 slender bristles, one of which issues near the base from a distinct ledge of the anterior edge, the other 3 from the end. The 3rd joint is about the length of the 2 preceding ones combined, and gradually tapers somewhat distally. It carries 2 successive bristles at about the middle of the anterior edge, and another bristle at the end. The terminal part is very sharply marked off from the basal part, being greatly constricted at the base, and connected with the basal part by a very mobile articulation. It is somewhat shorter than the 3rd basal joint, and of the 3 joints composing it, the 1st is much the largest, about equalling in length the other 2 combined. This part carries several very long and slender bristles, 5 of which issue from the tip.

The posterior antennæ (fig. 4) form each a simple curved stem, consisting of 3 joints, the 1st of which constitutes the basal part, the other 2 the inner ramus, no trace of an outer ramus being present. The basal joint is oblong and gently curved, with the anterior edge bulging considerably in the middle, and carrying at the end a slender bristle. The 2nd joint is shorter than the 1st, but rather broad, fusiformly dilated, and quite naked. The terminal joint is scarcely more than half as long as the 2nd, and carries 10 spiniform,

Digitized by Google

anteriorly-curving setæ, 6 of which issue close together from the tip, the other 4 from a slight protuberance of the anterior edge near the base. These 2 groups of setæ are only separated by a very short interspace.

The oral orifice occurs, at rather a long distance from the antennæ, at the tip of an obtuse protuberance projecting from about the middle of the ventral face of the cephalic segment (see fig. 2). It is bounded in front by a slight chitinous lamella, representing the anterior lip; and on each side of it the extremely small mandibles and maxillæ have their place.

The mandibles (fig. 5) each form a very small, but highly chitinized piece, the extremity of which is abruptly incurved, and produced to 2 strong cutting teeth, finely denticulated along one of their edges, and each accompanied by a slender bristle. The palp is wholly absent.

The maxillæ (fig. 6) are still smaller than the mandibles, and more membranous in structure, each carrying a single ciliated bristle inside, and 4 such bristles outside, attached to a slight lamellar expansion, the tip itself being conically produced and incurved, with 2 small apical spines.

The anterior maxillipeds (fig. 7) originate just behind the buccal protuberance, and extend obliquely in front, so that their extremities project at the sides of the oral orifice. They each consist of a thick, muscular basal part, to the end of which a more highly chitinized and incurved piece is movably articulated. This piece, which is of no considerable size, projects at the end in 2 claw-like teeth, fringed along one edge with closely-set denticles in a comb-like manner. The teeth are somewhat unequal in size, the outer one being the larger; and, as in the mandibles, they are both accompanied by a slender bristle.

The posterior maxillipeds (fig. 8), which originate immediately behind the anterior, are rather powerful, and pronouncedly prehensile, exhibiting besides the basal part, a dilated hand, upon which a strong, claw-like dactylus admits of being impinged. The basal part is quite simple, without any armature. The hand is twice as long as the basal part, and oval in form, with 2 strong, denticulated spines inside. The dactylus is very strong, somewhat shorter than the palm, and coarsely denticulated along the inner edge.

Of legs, 5 pairs are present, the 4 anterior ones being natatory, whereas the last pair are simple.

Digitized by Google

The natatory legs (figs. 9—12) are built upon the Cyclopoid type, the basal part being very broad and lamellar, and both rami distinctly 3-articulate, and not differing much in size. In each pair the 2 legs are held together by a broad chitinous plate, intercalated between the 1st basal joints, so as only to admit of simultaneous movement (see fig. 9). Although these legs are of essentially the same structure, yet, on a closer comparison, several minor differences may be found to exist between them, making it necessary to describe each pair separately.

The 1st pair of legs (fig. 9) have the rami somewhat shorter than in the succeeding pairs. On the other hand, the basal part is fully as large, and has the inner corner of the 2nd joint rectangular, with a straight, deflexed spine attached to it. On the outer side of this joint, as in the 3 succeeding pairs, a small bristle is attached. The outer ramus is a little longer and also broader than the inner, and has the terminal joint about the length of the other 2 combined. Each of the latter carries outside a strong spine, but only the 2nd joint has a natatory seta inside, the 1st joint being devoid of any such seta, both in this and the 3 succeeding pairs. The terminal joint has 4 natatory setæ, and 4 spines gradually increasing in length distally, 3 of them issuing from distinct ledges of the outer edge, the 4th from the tip. All the spines, both in this and the succeeding pairs, are bordered by a hyaline, finely serrated rim. The inner ramus is fringed outside with delicate cilia, and has the terminal joint as long as the other 2 combined. It carries 7 natatory setæ, 5 of which belong to the terminal joint, which, moreover, has at the tip a spine of the same structure as those of the outer ramus.

The 2nd pair of legs (fig. 10), like the 2 succeeding pairs, have the inner corner of the 2nd basal joint produced to a short acute projection, but without any spine. Both rami are more elongated, and of about equal size, the terminal joint in both being considerably longer than the other 2 combined. The number of spines on the outer ramus is the same as in the 1st pair, but the terminal joint has one additional natatory seta. The inner ramus has only 6 such setæ, one on the 1st, 2 on the 2nd, and 3 on the last joint. On the other hand, there are 3 spines on the terminal joint, 2 of which issue from the tip, the 3rd from a ledge of the outer edge.

The 3rd pair of legs (fig. 11) have the rami still more elongated, the outer one differing from that of the 2nd pair in the absence of the proximal

Digitized by Google

spine of the terminal joint, the inner one in having only 2 natatory setæ inside the last joint[1].

The 4th pair of legs (fig. 12) have the outer ramus exactly as in the 3rd pair, whereas the inner ramus is much narrower, and projects considerably beyond the outer. This ramus also differs in having only a single natatory seta inside the terminal joint, attached at a short distance from its base.

The last pair of legs (see figs. 13 & 14), as in other *Cyclopoida*, are very small and simple in structure, issuing somewhat laterally from the basal segment of the trunk. In most other *Cyclopoida* the legs of this pair are biarticulate; but in the present form, the proximal joint is completely consolidated with the segment, and is only indicated by the slender bristle belonging to it, which in this case issues from the segment itself, outside the base of the distal joint. The latter is rather unlike that in the other known species of this genus, forming a slender cylindric piece provided at the tip with 2 subequal setæ. This piece extends obliquely upwards, so as to project dorsally, when the animal is viewed laterally (fig. 2): hence the specific name *notopus*, proposed by Dr. Giesbrecht for this species.

The adult male is much smaller than the female, and on the whole resembles that of the next species (conf. fig. 15). It is easily to be distinguished from the female by the more powerfully developed posterior maxillipeds, and by the structure of the tail. The latter is composed of 5 well-defined segments, the 1st of which, the genital segment, is greatly tumefied, and generally contains, within its lateral parts, 2 vesicular spermatophores ready to be evacuated. During copulation, the male grasps the female with his powerful posterior maxillipeds dorsally at the boundary between the last segment of the trunk and the genital segment; the 2 sexes are not infrequently found locked together in this manner even after having been preserved in alcohol (conf. fig. 15).

Occurrence. This form occurred very abundantly in some samples taken on the 13th October, 1893, north of the New Siberian Islands, the tow-net having been lowered to a depth of 50 metres.

Distribution. Pacific Ocean, between 90° and 124° W., 11° N. and 3° S., down to 1000 metres (Giesbrecht).

---

[1] In the figure here given, 3 such setæ are, by a mistake, delineated.

Digitized by Google

25. *Oncæa conifera*, Giesbrecht.

(Pl. XXXII, figs. 15, 16).

Oncæa conifera, Giesbrecht, l. c. p. 600. etc., Pl. 2, fig. 10; Pl. 47, figs. 4, 16, 21, 28, 34—38, 42, 55.

Specific Characters. Body comparatively more slender than in the preceding species, greatest width of anterior division not nearly attaining half the length. 1st pedigerous segment in female exhibiting dorsally a very conspicuous coniform gibbosity. Tail about half the length of the anterior division, genital segment scarcely longer than the remaining part of the tail. Caudal rami fully twice as long as they are broad, innermost apical seta shorter than the outermost. Anterior antennæ comparatively narrower than in *O. notopus*, 3rd joint longer than the 2 preceding ones combined, and nearly twice the length of the terminal part. Posterior antennæ with the last joint almost as long as the 2nd, and having the 2 groups of anteriorly-curving setæ separated by a rather long interspace. Posterior maxillipeds with the dactylus rather slender, and about the length of the palm, palmar spines likewise slender. 2nd, 3rd and 4th pairs of legs with the inner ramus produced at the tip, between the 2 apical spines, to a triangular projection. Last pair of legs rather small, with the distal joint short, oval, not projecting dorsally, apical setæ very unequal. Length of adult female 0·75 mm.

Remarks. This form also, at least in the female sex, is distinguished fairly well from the other species by an easily observable character, viz., the peculiar dorsal gibbosity of the 1st pedigerous segment, this character, indeed, having given rise to the specific name *conifera*, proposed by Dr. Giesbrecht. It also differs from the preceding species in several other points, mentioned in the above diagnosis. Any more detailed description of it is not, I think, needed to show its identity with the form recorded by Dr. Giesbrecht.

Occurrence. This form was found rather plentifully in the same samples, in which the preceding species occurred.

Distribution. Coast of Norway, Mediterranean, Pacific Ocean, between 87° and 132° W., 13° N. and 3° S., down to 4000 metres (Giesbrecht).

Digitized by Google

Gen. *Lubbockia*, Claus.

Remarks. This genus was established in the year 1863 by Prof. Claus, to include a peculiar pelagic Copepod found at Messina, *L. squillimana*. Another species, *L. aculeata*, has recently been added to this by Dr. Giesbrecht, both forms having been stated by the same author to occur also in the tropical parts of the oceans. North of the Mediterranean, however, neither of them have ever been recorded, and the genus has therefore been supposed to have quite a southern distribution. It was therefore very surprising to find this genus represented in the Polar Sea by a well-marked species, closely allied to one of the 2 previously known forms.

The present genus undoubtedly belongs to the same family as *Oncæa*, though differing rather markedly, both in the presence of only a single (dorsal) ovisac, and in the structure of the oral parts. The latter, as also the posterior antennæ, exhibit a pronounced resemblance in structure to those appendages in the genus *Lichomolgus*, Torell, the species of which, as is well known, live a parasitic life within the branchial cavity of Ascidians. It is, indeed, very probable, that the species both of the present genus and that of *Oncæa*, lead a semi-parasitic existence on some pelagic animals; but as yet, their hosts have not been ascertained.

26. *Lubbockia glacialis*. n. sp.
(Pl. XXXIII).

Specific Characters. ♀. Body very slender and elongated, with the anterior division somewhat tumid and, seen dorsally, oblong oval in form, somewhat more attenuated behind than in front, anterior extremity evenly rounded, penultimate pedigerous segment slightly emarginated behind, with the lateral corners scarcely produced. Tail exceedingly narrow and elongated, rod-like, about equalling in length 2/3 of the anterior division, segments smooth, without any circlets of denticles behind, genital segment slightly dilated in its anterior part, anal segment scarcely more than half as long as the preceding one. Caudal rami about twice the length of the anal segment, and narrow linear in form, pointing straight behind, seta of the outer edge occurring about in the middle. Anterior antennæ 7-articulate, and clothed with very long bristles, among which a number of very delicate sensory

Digitized by Google

filaments may be discerned. Posterior antennæ with the terminal joint long and narrow, with 6 comparatively short, anteriorly-curving apical setæ, and another much longer seta issuing from a distinct ledge inside the tip. Posterior maxillipeds with the hand perfectly smooth, dactylus long and slender, finely denticulated inside. Natatory legs with the spines of the outer ramus very slender, the apical one almost attaining the length of the whole ramus, all bordered with a hyaline, smooth rim. Last pair of legs rather small, with the 2 apical spines of the same structure as those on the natatory legs, the larger one reaching only a little beyond the middle of the genital segment. Length of adult female 2·45 mm.

Remarks. This form does not agree fully with either of the 2 hitherto known species, though approaching somewhat nearer to *L. aculeata* than to *L. squillimana*. It differs materially, from the former, however, in the perfectly smooth caudal segments, as also in the relative length of these segments. Moreover, on a closer comparison, some minor differences may be found to exist in the structural details.

Description of the Female.

The length of the body in fully adult specimens amounts to 2·45 mm., and this form accordingly grows to a somewhat larger size than either of the 2 hitherto known species, the larger of which (*L. aculeata*), according to Dr. Giesbrecht, has a length of 2·30 mm.

The body is highly pellucid, allowing the intestine, the anterior part of which forms a large oval dilatation (see figs. 1 & 2), to be distinctly seen through its thin walls. The general form is very slender and elongated, with the 2 chief divisions rather sharply marked off from each other. The anterior division is somewhat tumid, and, seen dorsally (fig. 1), exhibits a rather regular oblong oval or obovate form, with the greatest width not quite attaining half the length, and occurring in front of the middle. The anterior extremity appears evenly rounded, the posterior more attenuated. As in *Oncæa*, this division consists of 6 well-defined segments, the 1st of which, the cephalic segment, is about the length of the 4 succeeding ones combined. The penultimate segment is slightly emarginated in the middle, and has the lateral corners far less prominent than in *L. aculeata*, and rounded off at the tips. The last segment of the trunk, as in other *Cyclopoida*, is very

Digitized by Google

sharply marked off from the preceding one, with which it forms a very movable articulation, whereas it is firmly connected with the 1st caudal segment, so as apparently to form part of the tail. It is also much narrower than any of the preceding segments, and only very slightly dilated distally.

The tail proper (fig. 14) is exceedingly narrow, almost rod-like, and equals in length about 2/3 of the anterior division. It is composed of 4 well-defined segments besides the caudal rami, all being perfectly smooth, without any traces of the circlets of denticles found in the other 2 species at the posterior edges. The genital segment is much the largest, occupying about 1/3 of the length of the tail. It is slightly dilated in its anterior part, and, as in *Oncæa*, has the genital orifices situated somewhat dorsally. None of the specimens found were ovigerous; but there cannot be any doubt that the ova in the present form, as in *L. squillimana*, are congregated within a single dorsal ovisac. The anal segment is much smaller than the others, scarcely exceeding half the length of the preceding segment, whereas in the other 2 species, this segment is about the same size as the latter. The caudal rami are very slender, linear, nearly twice as long as the anal segment, and extend straight behind. They each carry 6 setæ, 4 apical and 2 lateral. One of the latter is attached close to the tip, the other at about the middle of the outer edge. Both these setæ are rather short, and this is also the case with the innermost apical seta. The remaining 3 setæ are distinctly ciliated, the middle one being much the largest, attaining nearly 1/3 of the length of the tail, whereas the outer one is scarcely half as long as the inner.

No trace of eyes could be detected, and indeed in neither of the 2 previously known species have such organs been found to exist.

The anterior antennæ (fig. 3) are much shorter than the cephalic segment, and, on the whole, agree in structure with those in *Oncæa*, being clothed with slender bristles of considerable length, among which a limited number of very delicate sensory filaments may be discerned. They apparently consist of 7 joints, 4 of which belong to the basal part, the other 3 to the terminal part. The joints of the former part are, however, far from being distinctly defined. On the other hand, the lines of demarcation between the 3 joints of the terminal part are fully as distinct as in the genus *Oncæa*, which is not the case in the other 2 species.

Digitized by Google

The posterior antennæ (fig. 4) form each a very slender stem abruptly bent in front of the middle. This stem, as in *Oncæa*, consists of only 3 joints, the 1st of which constitutes the basal part, the other 2 the inner ramus, the outer ramus in this instance being also quite obsolete. The basal joint is quite unarmed, and but slightly dilated distally. The 2nd joint is very small, and carries anteriorly a very delicate bristle. The 3rd joint is slender and elongated, fully as long as the other 2 combined, and is narrow linear in form. It has the posterior edge finely ciliated, and carries anteriorly 2 small bristles, separated by a long interspace. From the obtusely rounded tip, 6 comparatively short, anteriorly-curving bristles issue close together, and immediately inside them, 2 other bristles are attached to a separate ledge, one of them of considerable length.

The mandibles (fig. 5) agree with those in *Oncæa* in the total absence of a palp. Otherwise, however, they are rather different, and more resemble in structure those in the parasitic genus *Lichomolgus*. As in that genus, they each terminate in a falciform lappet bordered along the convex edge with a finely serrated rim, and exserted to a thin flexible point, which projects far into the buccal cavity. Outside this lappet, a straight spine of no great size, and 2 falciform setæ are attached, and at this place the mandible is clothed with a number of delicate hairs.

The maxillæ (fig. 6) are very small and simple in structure, each terminating in a conical prominence, tipped with 2 unequal ciliated setæ, and having a thin plate outside, carrying 3 likewise ciliated setæ. This plate seems to answer to the palp, and is well-defined at the base.

The anterior maxillipeds (fig. 7) exhibit each a broad and muscular basal part, and an incurved, biarticulate terminal part. The 1st joint of the latter carries inside a strong, slightly curved spine, closely dentated along the convex edge in a comb-like manner, and opposite to it a slender ciliated seta. The 2nd joint has 2 comparatively short apical spines, the outer of which is dentated in a similar manner to the inner spine of the 1st joint.

The posterior maxillipeds (fig. 8) are rather powerful, and, as in *Oncæa*, pronouncedly prehensile, consisting of a short basal joint, an oval dilated hand, and a slender, claw-like dactylus, which admits of being impinged upon the latter. Both the basal joint and the hand are quite unarmed, whereas in the other 2 species, the palmar edge is divided into a number of dentiform

Digitized by Google

projections. The dactylus is very slender, fully as long as the palm, and but slightly curved, with the inner edge finely denticulate.

The natatory legs (figs. 9—12) are built upon the very same type as in *Oncæa*, though exhibiting some minor differences, both as to the basal part and the rami. The 1st basal joint in all pairs except the 4th, has a plumose seta inside, that is wanting in *Oncæa;* and the inner corner of the 2nd joint is broadly rounded and perfectly smooth, the terminal edge projecting, in all the pairs, between the insertions of the rami, in a well-marked triangular prominence. The rami agree closely in structure with those in *Oncæa*, and carry the very same number of spines and natatory setæ. The spines, however, are much more slender, and the hyaline rim appears quite smooth. The apical spine of the outer ramus almost equals in length the whole ramus.

The last pair of legs (see figs. 13 & 14) form each a small cylindrical piece attached to the sides of the last segment of the trunk, and more properly representing the distal joint, the proximal joint being wholly consolidated with the segment. At the end of this piece are 2 unequal spines, both of exactly the same structure as the spines of the natatory legs. The inner and larger spine extends only a little beyond the middle of the genital segment, whereas in *L. aculeata*, it reaches nearly to the posterior edge, and in *L. squillimana* even projects beyond the limits of this segment.

Occurrence. Some few specimens of this peculiar Copepod, all of the female sex, were found in a sample taken May 22nd, 1894, between the 81st and 82nd degrees of latitude, the tow-net having been lowered to a depth of 100 metres.

Tribe: AMPHARTHRANDRIA.

Remarks. This tribe is here taken in a more restricted sense than is done by Dr. Giesbrecht, who comprises in it all Copepoda in which both antennæ of the 1st pair in the male are prehensile. In my opinion, the 2 families *Monstrillidæ* and *Harpacticidæ* are so very distinct, that they ought both to be regarded as great divisions equivalent to the division *Calanoida*, only the *Cyclopoid* forms with the above character being kept in the tribe.

Digitized by Google

Fam. OITHONIDÆ[1].

Gen. *Oithona*, Baird.

Remarks. Of this genus, 2 distinct species occur off the Norwegian coast, one of them being more than twice as large as the other. Boeck records these 2 species under the names *O. spinifrons* and *O. pygmæa*. The first-named form is most probably identical with *O. plumifera*, Baird, the 2nd with *O. helgolandica*, Claus, both these names having the priority to those proposed by Boeck. In Dr. Giesbrecht's opinion, both the Norwegian forms recorded by Boeck are identical with the Mediterranean species described by Claus as *O. similis*. This is evidently erroneous, since, as stated above, the 2 Norwegian forms are very distinct the one from the other. Nor can I admit the assumption of Dr. Giesbrecht, that *O. helgolandica* and *O. similis* are identical, as it seems hardly probable that Claus would have described the very same species under 2 different names. In the Polar Sea, this genus is represented by a single species, which has turned out to be identical with one of the 2 forms occurring off the Norwegian coast.

27. *Oithona helgolandica*, Claus.

Syn: *Oithona pygmæa*, Boeck.
„ „ *spinifrons*, Brady (not Boeck).
„ „ *spinirostris*, Giesbrecht (not Claus).

Some few specimens of this form were found in 2 samples taken October 12th and 13th, north of the New Siberian Islands.

Distribution. Coast of Norway (very common), British Isles, Heligoland, Bay of Kiel.

Fam. MORMONILLIDÆ.

Gen. *Mormonilla*, Giesbrecht.

Remarks. The systematic position of this remarkable genus, established by Dr. Giesbrecht, appears somewhat doubtful, since only one sex, the female one, is as yet known. I think, however, that Dr. Giesbrecht is quite

[1] I think the establishment of this family is necessary. Dr. Giesbrecht refers the genus *Oithona* to the family *Cyclopidæ*.

Digitized by Google

right in referring it to his tribe *Amphartbrandria*, and it will unquestionably also be found to belong to this tribe in the restriction here adopted, exhibiting, as it does, no affinity whatever to either the *Monstrilloida* or *Harpactoida*, whereas the *Cyclopoid* type is unmistakable. In general appearance, this genus somewhat recalls that of *Oithona*, but in its structural details it differs to an extent that does not allow of its being included in the same family, the new family *Mormonillidæ*, established by Dr. Giesbrecht, being evidently needed for its reception. Dr. Giesbrecht records 2 species of this genus, viz., *M. phasma* and *M. minor*, both taken in the Pacific Ocean south of the equator, from great depths (1800 metres). The occurrence of a species of this genus in the Polar Sea is of considerable interest, and, in order to ascertain the relation of this form to the 2 species described by Dr. Giesbrecht, I have subjected the specimens to a very careful examination, without, however, having come to a definite conclusion as to whether the polar form is or is not identical with one of them. It seems to agree best with the species named by Dr. Giesbrecht *M. minor*; but the agreement is not quite perfect, and, as the places where these 2 forms were found are so widely remote, I prefer to describe the polar form provisionally as a new species, leaving the ultimate decision regarding the identity or non-identity of the two forms for future investigations.

28. *Mormonilla polaris*, n. sp.

(Pl. XXXIV).

Specific Characters. — ♀. Body very slender, with extremely thin and pellucid integuments. Anterior division oblong fusiform, slightly depressed anteriorly, with the greatest width occurring rather in front of the middle; anterior extremity, seen dorsally, obtusely truncate, posterior greatly attenuated. 1st pedigerous segment well defined from the cephalic segment, and rather large, exceeding in length the succeeding ones combined. 4th pedigerous segment very slightly emarginated behind, and having the lateral corners scarcely produced at all. Last segment of trunk not broader than the caudal segment, and quite simple, without any trace of appendages. Tail, inclusive of the caudal rami, somewhat exceeding half the length of the anterior division, genital segment evenly rounded below, anal segment much larger than the middle one. Caudal rami exceedingly slender and elongated, equalling in

Digitized by Google

length the caudal segments and the last segment of the trunk combined, lateral seta occurring at the end of the first 5th part of the ramus. Anterior antennæ fully as long as the anterior division of the body, and composed of only 3 distinct joints clothed with very strong setæ, which, as a rule, issue from cup-shaped ledges; 1st joint somewhat longer than the other 2 combined, the latter about equal in size. Posterior antennæ with the outer ramus about the length of the proximal joint of the inner, and 7-articulate. Outer ramus of the 3 anterior pairs of legs distinctly 3-articulate, that of 4th pair biarticulate; inner ramus of 1st pair 3-articulate, of 2nd pair biarticulate, of 3rd and 4th pairs uniarticulate. Length of adult female 1·38 mm.

Remarks. As mentioned above, this form seems to be closely allied to one of the species recorded by Dr. Giesbrecht, viz., *M. minor*. Of this species, however, only 2 detail-figures have been given (a posterior maxilliped and a 2nd leg), and it is therefore as yet scarcely possible to institute any closer comparison between these 2 forms.

Description of the Female.

The length of the body, measured from the front to the end of the caudal rami, is 1·38 mm. Dr. Giesbrecht gives the length of his *M. minor* as 1·25—1·35 mm.. and that of *M. phasma* as 1·58—1·73 mm.

The whole body, even in the preserved state, is so perfectly hyaline, that it was a matter of no little trouble to pick up the specimens from the sample. The general form of the body (see figs. 1 & 2) is slender and elongated, with no very sharp demarcation between the 2 chief divisions, though the posterior is much narrower than the anterior. The latter division is somewhat depressed, especially in its anterior part, and, seen dorsally (fig. 1), exhibits an oblong fusiform shape, with the greatest width not attaining 1/3 of the length, and occurring considerably in front of the middle. It gradually tapers behind, somewhat less in front, and has the anterior extremity obtusely truncated. The cephalic segment is well defined, and occupies about 2/5 of the length of the anterior division. Seen laterally (fig. 2), the dorsal face of this segment declines obliquely towards the front, which appears narrowly rounded, and slightly deflexed between the insertions of the anterior antennæ. The 1st pedigerous segment is rather large, exceeding in length the 2 succeeding segments combined. The penultimate segment is only very

Digitized by Google

slightly emarginated behind, and has the lateral corners scarcely at all produced. The last segment, as in other *Cyclopoida*, is very movably connected with the preceding one, and much narrower, being scarcely broader than the caudal segments. It is quite simple, subcylindric in form, and does not exhibit the slightest trace of any limbs.

The tail proper is about half the length of the anterior division, and is composed of only 3 segments, besides the caudal rami. The 1st or genital segment, as usual, is the largest, equalling in length the other 2 combined; and it is but very slightly dilated in its anterior part, with the ventral face a little protuberant, exhibiting the genital orifices on each side. How the ova are carried is still unknown, as no ovigerous specimens have as yet been met with. It is not improbable, that they are congregated within a single ovisac, which in this instance may be ventral, as in the *Calanoids*. The last, or anal segment is considerably larger than the middle one, and is transversely truncated at the end. The caudal rami (see fig. 12) are exceedingly slender and elongated, equalling in length the remaining part of the tail and the last segment of the trunk combined. They are narrow linear in form, and slightly divergent, with the inner edge finely ciliated throughout. The outer edge, on the other hand, is ciliated for a very short distance proximally, and has, at about the end of the first 5th part, a distinct ledge, to which a very slender seta is attached, extending behind almost to the tip of the ramus. The latter is transversely truncated, and carries 5 setæ, the outermost and innermost of which are very small, hair-like. The other 3, like the lateral seta, are distinctly ciliated, and of rather unequal length, the middle one being much the longest, and fully twice the length of the ramus. Of the other 2, the inner one is 3 times as long as the outer. A very delicate and slender bristle is also attached to each ramus close to the tip dorsally.

As in the other 2 species, no trace of eyes is found.

The anterior antennæ (see figs. 1 & 2) are slender and elongated, reaching, when reflexed (see fig. 2), somewhat beyond the genital segment. In spite of their great length, they are found to be composed of a very limited number of joints, only 3 of them being distinctly defined. Of these the 1st is somewhat longer than the other 2 combined, the latter being of about equal length. All the joints carry scattered setæ of unequal size, some of

Digitized by Google

them very strong, and issuing from cup-shaped ledges. From the last joint 7 or 8 such setæ originate, forming together a large brush.

The posterior antennæ (fig. 3) somewhat resemble in structure those in the *Calanoida*, having both rami well developed. The basal part is comparatively small, with its 2 joints imperfectly defined, and carries at the end anteriorly a single ciliated seta. The inner ramus is gently curved, and consists of 2 nearly equal-sized joints, the 1st of which exhibits a distinct ledge somewhat beyond the middle of the anterior edge, carrying 2 unequal setæ. The distal joint is somewhat constricted at the base, and very slightly dilated in its outer part, exhibiting traces of the bilobular form characteristic of the *Calanoida*. The anterior lobule, however, is only indicated by a very slight bulging of the anterior edge, carrying 3 or 4 successive setæ increasing in length distally. From the transversely truncated tip, 8 or 9 very slender setæ originate very close together, some of them much elongated, considerably exceeding in length the whole antenna. All the setæ are fringed with stiff hairs, unequal, and rather far apart. The outer ramus is about the length of the proximal joint of the inner, and cylindrical in form, being divided into 7 well-defined joints, the 1st of which is the largest, all the others very short. It carries in all 10 ciliated setæ of moderate length, 2 of which issue from the 1st, 3 from the last joint.

The mandibles (fig. 4) likewise recall somewhat those in the *Calanoida*, both in the structure of the masticatory part, and in the very full development of the palp. The masticatory part is rather broad, securiform, and has the cutting edge divided into 8 comparatively small and simple teeth, the outermost of which is the largest, and separated from the others by a deep incision. The palp is considerably larger than the body of the mandible, and is distinctly biramous, with the basal part oblong quadrangular in form, and carrying 3 setæ inside, 2 at the end, and one somewhat beyond the middle. Both rami are uniarticulate and lamellar in structure, about equal in size, but of somewhat different shape. The inner ramus is oval in form, and carries along the oblique inner edge a row of 6 remarkably large and coarsely ciliated setæ, increasing in length distally. The outer ramus, which issues from the basal part somewhat more proximally, has the form of a triangular lamella, which likewise carries 6 large, ciliated setæ.

Digitized by Google

The maxillæ (fig. 5) are of more complicated structure than is usual in the *Cyclopoida*, and, indeed, all the chief parts found in the *Calanoida* may be easily traced. The basal division is well defined, and projects inside to a conical masticatory lobe armed at the tip with 3 ciliated spines, and a similar number of short, likewise coarsely ciliated bristles. Opposite this lobe, on the outer side of the basal part, is a very small lobule carrying 2 densely plumose setæ, and apparently answering to the vibratory plate in the *Calanoida*. The palp is of considerable size, membranous in consistency, and distinctly biramous. The inner edge is divided proximally into 2 successive conical lobules, each carrying 2 unequal setæ, and evidently answering to the 2 setiferous lobes generally found in the *Calanoida*, immediately beyond the masticatory lobe. The distal part of the palp beyond these lobules, is somewhat produced, and carries 8 remarkably strong curved setæ, coarsely ciliated and successively increasing in size distally. On a closer examination, 4 of these setæ are found to issue from a well-defined, though rather short, terminal joint, which evidently represents the inner ramus. The outer ramus forms a rather large, rounded oval plate, issuing outside the proximal part of the palp, and carrying 6 very strong and densely ciliated setæ, 5 of which issue from the obtusely truncated end, the 6th from a ledge of the outer edge.

The anterior maxillipeds (fig. 6) are also rather unlike those in the typical *Cyclopoida*, and exhibit some points of agreement with those in the *Calanoida*. They are comparatively large, and in all the specimens examined, were extended backwards along the sides of the 1st pedigerous segment (see figs. 1 & 2). They each consist of a slightly curved stem divided into 5 joints, the first 2 being rather large, and together constituting the basal part, whereas the other 3 are very small. There are 3 distinct digitiform lobes of the anterior edge, one belonging to the 1st basal joint, the other 2 to the proximal part of the 2nd basal joint. The first 2 lobes are rather narrow and somewhat upturned, each carrying 3 coarsely ciliated setæ, whereas the 3rd lobe has only 2 such setæ. Moreover a single, rather short seta occurs at some distance beyond the 3rd lobe. It may be noted, that Dr. Giesbrecht in *M. phasma* has found a 4th, very small lobe, issuing close to the base, and carrying 4 comparatively short setæ. It is very probable that a similar lobe also exists in the present species, but has been lost in

Digitized by Google

the dissection. From the very short terminal part, 5 very long and curved setæ issue, 3 of which belong to the last joint, which, moreover, carries a short, simple bristle.

The posterior maxillipeds (fig. 7) are somewhat shorter than the anterior, and are composed of only 2 distinctly defined joints, movably articulated together. The proximal joint is rather broad and expanded, with the anterior edge cut out into 3 successive rounded lobes, each carrying a remarkably thick and densely hairy seta curved obliquely upwards. This seta is accompanied on the proximal lobe by another seta of much smaller size, and on the distal lobe by 2 still smaller, hair-like bristles. Moreover, a ciliated, anteriorly-curving seta of quite normal appearance issues from a small knob-like prominence near the end of the joint anteriorly. The distal joint is scarcely more than half as long as the proximal one, and much narrower, exhibiting at the tip an imperfectly defined, very small terminal articulation. It carries 5 anteriorly-curving, ciliated setæ, diminishing in length distally, and also a very small apical bristle. In structure, these maxillipeds agree very closely with those in *M. minor*, as figured by Dr. Giesbrecht.

The natatory legs (figs. 8—11) successively diminish in size posteriorly, and exhibit a rather peculiar structure, differing considerably from that usually met with in the *Cyclopoida*.

The 1st pair of legs (fig. 8) have the basal part much larger than in the other pairs, and lamellar in structure, its 1st joint being particularly large, and provided at the end inside with a small unciliated bristle. The 2nd basal joint has the inner edge somewhat bulging in the middle, and exhibiting there 3 extremely small, hair-like bristles, below which a somewhat longer, but unciliated seta is attached. Both rami are 3-articulate, though the line of demarcation between the first 2 joints of the inner ramus is far from being distinct. The outer ramus is considerably larger than the inner, and has the 1st joint longer than the other 2 combined. At the end, this joint projects outside to a short spiniform process, but has no seta inside. Outside the 2nd joint is a similar, but somewhat larger spiniform process, and inside a very strongly developed natatory seta. The 3rd joint, which is but little larger than the 2nd, carries 4 long natatory setæ, 2 of which issue from the tip; and it exhibits outside 2 successive spiniform processes, which are still more produced than those of the 2 preceding joints.

Digitized by Google

The inner ramus has the 1st joint almost as long as the other 2 combined, and considerably broader, with 2 hair-like bristles inside. The 2nd joint has a similar bristle inside, and the 3rd joint carries 3 natatory setæ, the 2 apical ones being very long, whereas the 3rd, which issues from a ledge inside, is considerably shorter, and is peculiarly twisted in its distal part.

The 2nd pair of legs (fig. 9) have the basal part quite simple, without any bristles or setæ. The outer ramus, as in the 1st pair, is distinctly 3-articulate, with the 1st joint much longer than the other 2 combined. This joint is finely ciliated along the inner edge; but the outer edge is perfectly smooth, without any armature whatever. This is also the case with the 2nd joint, which, however, carries the usual natatory seta inside. The 3rd joint is somewhat larger than the 2nd, and carries 5 natatory setæ, and, outside the 2 apical ones, a very small ciliated bristle. The inner ramus is both shorter and narrower than the outer, and is composed of only 2 joints, the 1st quite simple, the 2nd, in addition to the 3 setæ found in the 1st pair, carrying inside them a very small ciliated bristle.

The 3rd pair of legs are of the same structure as the 2nd, except that the inner ramus (fig. 10) is uniarticulate.

The 4th pair of legs (fig. 11) are considerably smaller than the others, and have the outer ramus biarticulate, with 5 natatory setæ, 4 of which belong to the distal joint. The inner ramus, as in the 3rd pair, is uniarticulate, and much smaller than the outer, carrying 3 natatory setæ of about equal size, 2 apical and one lateral.

As stated above, not the slightest trace of any 5th pair of legs is to be detected.

Occurrence. Some few specimens of this remarkable Copepod, all of the female sex, were found in the same sample in which the above-described *Lubbockia glacialis* occurred.

Digitized by Google

OSTRACODA.

Tribe: MYODOCOPA.

Fam. CONCHŒCIIDÆ.

Gen. *Conchœcia*, Dana.

Remarks. This genus was established in the year 1853 by Dana, to include 2 peculiar pelagic Ostracoda from the tropical parts of the oceans, and some years afterwards a 3rd species from the Atlantic Ocean was added by Lubbock, though referred by him to the nearly-allied genus *Halocypris*. The first statement of the occurrence of this genus also in the northern oceans, was made by the present author, who, in the year 1865, recorded 3 Norwegian species, 2 of which were taken from great depths off the Lofoten Islands. In recent times, a number of additional species have been described from different parts of the oceans, and among them is a form recorded by Messrs. Brady and Norman, which seems to be peculiar to the Arctic Ocean, and which also occurred very abundantly in the samples brought home from the Nansen Expedition. As only a very short description, accompanied by some few figures, has been given by Messrs. Brady and Norman, I propose in the following pages to describe this beautiful and large-sized form more in detail, giving figures, on the last 2 plates, of both sexes, with anatomical analyses of each.

Conchœcia maxima, Brady & Norman.
(Pl. XXXV & XXXVI).

Conchœcia maxima, Brady & Norman, A Monograph of the marine and fresh-water Ostracoda of the North Atlantic and North-western Europe, Part II. Transact. Roy. Dublin Society, Vol. V, p. 686, Pl. LXI, figs. 1—8.

Specific Characters. Shell of female moderately tumid, seen laterally, oblong oval in form, somewhat widening behind, greatest height not quite equalling half the length, rostral prominence well defined and very slightly deflexed, subrostral notch rather deep, anterior extremity below the latter narrowly rounded, posterior obtusely truncated, ventral margin very slightly

Digitized by Google

sinuated in the middle, dorsal straight, with a slight depression in the middle, and joining the hind margin at an obtuse angle: — seen ventrally, regularly oblong ovate, greatest width somewhat exceeding 1/3 of the length, and occurring in the middle, anterior extremity narrowly subtruncate, posterior acute. Shell of male comparatively narrower than that of female, sub-cuneate, with the posterior extremity (seen laterally) obliquely truncated, and the ventral margin more distinctly sinuated. Valves thin and pellucid, sculptured with 2 sets of curved striæ crossing each other, and producing a close, but not very conspicuous reticulation, postero-dorsal corner armed with 3 or 4 small blunt teeth, somewhat increasing in size posteriorly. Extremity of frontal tentacle in both sexes club-shaped, hispid, but in male thicker and more sharply marked off at the base. Antennulæ in male with the 2 sensory appendages of about equal size, anterior apical seta much longer than the other 2, and having the median part somewhat thickened, and armed with numerous recurved denticles, its distal 3rd part abruptly bent downwards. Claw of accessory ramus of male antennæ much larger on the right than on the left side. Basal joint of mandibular palp about the length of the 2 succeeding joints combined. Caudal lamellæ each with 8 slender claws rapidly increasing in length anteriorly, the last, as usual, somewhat remote from the others, all being finely denticulate along the posterior edge. Length of adult female 3·50 mm., of male 3·20 mm.

Remarks. This form is very closely allied to one of the Norwegian species recorded by the present author under the name of *C. borealis*. It is, however, of larger size, and differs moreover, in the less strongly marked sculpture of the shell, as also somewhat in the form of the latter. On a closer comparison, some minor differences may also be found to exist in the structure of the several appendages.

Description of the Female.

The average length of the shell in fully adult specimens is 3·50 mm., and Messrs. Brady and Norman have even examined specimens of 3·60 mm. length. This is a size not nearly reached by any of the other known species, and this form therefore still deserves the specific name *maxima* proposed by Messrs. Brady and Norman.

Digitized by Google

The general form of the shell (see Pl. XXXV, figs. 1 & 2) is that characteristic of the genus *Conchœcia*, being rather elongated, with the anterior extremity produced above to a well-marked rostriform prominence, below which, there is a distinct notch on each side. Seen laterally (fig. 1), it exhibits an oblong oval, or rather somewhat cuneiform shape, being conspicuously narrowed in front, with the greatest height not quite attaining half the length, and occurring in its hindmost part. The rostral prominence, in this view of the shell, appears as a distinctly defined, beak-like process, projecting in front, and very slightly deflexed at the tip. Immediately below it, the shell has a rather deep sinus or notch, from which, in some cases, the natatory ramus of the antennæ may be found extended. The anterior extremity of the shell, below this notch, is narrowly rounded, the margin sloping without any intervening angle into the ventral one. The latter is somewhat oblique, and very slightly sinuated in the middle, joining the posterior margin by an abrupt curvature. The hind extremity of the shell appears broadly rounded, or rather obtusely truncated, and forms an obtuse angle above. The dorsal margin is nearly straight, and horizontal, with a very slight depression at about the middle.

Seen dorsally or ventrally (fig. 2), the shell appears moderately tumid, and rather regularly oblong ovate in form, with the greatest width about the middle, and somewhat exceeding 1/3 of the length. The lateral contours are evenly curved throughout, and the posterior extremity is acute, whereas the anterior appears considerably broader, and is obtusely truncated at the tip. The dorsal face of the shell is somewhat applanated, especially in its anterior part, whereas ventrally, the valves meet at an acute angle.

The valves are perfectly equal, and are united along the dorsal face by a simple ligament, admitting of being opened to a certain extent, and again closed; but anteriorly, below the rostral prominence, there always remains a somewhat cordiform opening leading to the inner cavity of the shell. As to consistency, the valves are very thin and elastic, and of chitinous structure; and they are so pellucid, that the enclosed animal may be traced through them rather distinctly. The surface is sculptured with two sets of curved striæ crossing each other, and producing a somewhat irregular and close reticulation, which, however, is far from being so strongly marked as in the nearly-

Digitized by Google

allied species *C. borealis*, where it assumes in some places an imbricated, squamous character. At the upper posterior corner there are 3 or 4 successive small denticles, somewhat increasing in size posteriorly. These denticles are, however, as a rule, only present on the right valve. The free edges of the valves are perfectly smooth throughout their whole length.

The animal is enabled to withdraw itself completely into the shell; but more generally the tip of the frontal tentacle, the terminal appendages of the antennulæ, and the natatory ramus of the antennæ are seen projecting in front from the above-mentioned opening, and below, the tip of the mandibular palps and the caudal plates, as a rule, also project beyond the edges. The animal is fixed to the shell by a strong adductor muscle joining each valve at about the centre, and just above this muscle, it is suspended to the dorsal face by a comparatively short ligament, within which the heart has its place. We may distinguish 2 chief divisions of the body, an anterior or cephalic part, and a posterior or abdominal part, both defined by the above-mentioned dorsal ligament and by the adductor muscle. The anterior division is, as it were, cut off in front, even being somewhat concave in its upper part, whereas below it projects into the hood-like anterior lip. It carries the antennulæ above, and between them a very delicate tentacular appendage. The enormously developed antennæ are attached to the sides, and below, the mandibles with their palps, and the maxillæ originate. The posterior, or abdominal division is very voluminous, and freely mobile within the hollow of the shell. It is covered by a soft skin closely wrinkled transversally, and is deflexed, exhibiting dorsally, at about the middle, 2 successive short prominences. Below, this division carries 3 pairs of legs, and to the gradually tapering and somewhat anteriorly curving end, the coarsely spinous caudal plates are secured.

The frontal tentacle (see fig. 4) is very delicate, extending as a narrow rod straight in front, and terminating in a slightly dilated, oblong fusiform, and somewhat deflexed capitulum, which is finely hispid throughout, and projects just beneath the rostral prominence of the shell.

The antennulæ (ibid) are likewise of rather delicate structure, and, it would seem, are scarcely mobile. They each form a simple stem extending anteriorly, at each side of the frontal tentacle, and about equalling in length

Digitized by Google

the rod-like portion of the latter. This stem seems to be composed of 4 joints, which, however, are far from being distinctly defined. The first 2 joints are rather elongated, and of about equal size, the 2nd carrying above, at some distance from the tip, a slender anteriorly-curving seta. The 2 distal joints are very small, and curve abruptly downwards, forming together a short terminal part. To the end of this part, 4 subequal and very delicate sensory filaments are attached, and in front of them a very slender seta, which projects far from the tip of the rostral prominence. Within the basal joint, a number of irregularly arranged lenticular bodies of a dark brownish colour may be traced, imbedded in a ganglionic mass. These bodies, which also occur in other species of this genus, seem to represent a sort of imperfect visual organs.

The antennæ (fig. 5) are very powerfully developed, constituting the chief locomotory organs of the animal. They each consist of an exceedingly large and broad basal part, and 2 very unequal rami. The basal part almost attains half the length of the shell, and is extended anteriorly. It is oblong triangular, or obpyriform in outline, with the hind extremity very broad and somewhat obliquely rounded, the anterior tapering gradually. Its inner face is applanated, whereas the outer is convex, and within it numerous strong muscles are seen converging to the anterior extremity, and chiefly acting upon the outer, or natatory ramus. The latter is very movably articulated to the end of the basal part, and somewhat exceeds half its length. It is narrow cylindric in form, and divided into 7 joints, the first of which is about 3 times as long as all the others combined. The latter form together a well-defined and very flexible terminal part of oblong fusiform shape, carrying, in all, 9 densely plumose natatory setæ, which successively increase in length proximally, and admit of being spread out in a fan-like manner. On a closer examination, these setæ are found to terminate in a naked lanceolate point of membranous consistency, and probably sensory in character. The inner, or accessory ramus is attached at some distance from the tip of the basal part inside, and, as a rule, extends downwards. It is composed of only 2 joints, the 1st of which has the form of a rounded, membranous lamella projecting anteriorly into 2 small successive prominences, the proximal one quite simple, acute, the distal one more prominent, and carrying 2 short setæ. The last

Digitized by Google

joint is very small and is movably articulated to the 1st, admitting, by the aid of 2 distinct muscles joining it, of being extended in front or reflexed. It carries on the tip 5 setiform appendages, the middle one being twice as long as the others, which are sensory in character.

The oral orifice (see Pl. XXXVI, figs. 1 & 2) is bounded by 2 well-defined lips, the anterior of which is very large, forming in front a very prominent, hood-like expansion, which is visible immediately below the basal part of the antennæ (see Pl. XXXV, fig. 1). The posterior edge, bounding the oral orifice in front, is highly chitinized and somewhat produced in the middle, exhibiting, on each side, a closely striated lamellar border. The posterior lip projects in 2 movable, incurved lappets of a somewhat securiform shape, and finely ciliated at the edges. Immediately behind this lip, the so-called sternal plate occurs, and from it several chitinous fillets originate, extending in different directions, to strengthen the insertions of the post-oral appendages.

The mandibles (Pl. XXXV, fig. 6), unlike what is generally the case in this division of Ostracoda, exhibit each a well-defined and highly chitinized body of narrow cuneiform shape, extending obliquely anteriorly across the sides of the cephalic part, immediately behind the basal part of the antennæ (see fig. 1). The masticatory part is defined by a neck-shaped constriction, and is squeezed in between the anterior and posterior lips. It is highly chitinized, and of a brownish hue, projecting in front to a short dentiform prominence. The cutting edge is divided into several short teeth, and immediately inside it is a closely fluted and hairy triturating surface, representing the molar tubercle (see fig. 7). The palp is very large and pronouncedly pediform, extending in front, on each side of the anterior lip, with the distal part curved downwards. It is composed of 4 well-defined joints, the 1st of which is much the largest, about the length of the 2 succeeding ones combined, and considerably dilated in its proximal part. This joint forms a rather large expansion below, with several slender setæ on the outer face, and extending as far as the tip of the masticatory part, outside which it lies. The narrowly truncated end of this expansion is divided into a row of short teeth, which no doubt assist the mandibles in cutting the food asunder. From the upper edge of this joint, at some distance

Digitized by Google

from the tip, a densely plumose seta originates. The 3 distal joints constitute together a very movable terminal part, which, as a rule, forms, with the basal joint, an abrupt geniculate bend. The joints gradually diminish in size, and carry scattered setæ, some of which are ciliated along one of the edges. Two of these setæ, issuing from the tip of the last joint, are particularly strong, almost claw-shaped.

The maxillæ (fig. 8) consist each of a thick, muscular basal part projecting inside in 2 linguiform masticatory lobes clothed with spiniform setæ, the outer one being somewhat larger than the inner. Outside these lobes, a well defined palp is movably attached, extending below. It consists of 2 joints, the 1st of which is rather large and expanded, oblong oval in form, and carries anteriorly 5 slender curved setæ, posteriorly 3 similar but shorter setæ and 2 small spines. The distal joint is rather small, and abruptly recurved, carrying several strong, curved spines at the tip.

The 2 succeeding pairs of limbs (Pl. XXXVI, figs. 3 & 4) have each, at the base outside, a trilobate vibratory (branchial) plate, placed vertically, and fringed with densely plumose setæ, the number of which is from 14 to 18. Both these pairs are pronouncedly pediform, whereas in other *Myodocopa*, the anterior pair have wholly lost their pediform character, and are generally described as a 2nd pair of maxillæ. In the present form, it is also found, that this pair, though, on the whole, resembling the succeeding one, exhibit some characters indicating that they are not exclusively locomotory, but also subservient to mastication. They are each composed (see fig. 3) of 4 distinctly defined joints, the 1st of which, however, differs materially from the others, forming a rather large and expanded basal part, provided at the anterior edge with several ciliated setæ, and, moreover, projecting at the end anteriorly in an obtusely conical prominence, densely clothed with spiniform setæ. This prominence is turned towards the mouth, and undoubtedly has the signification of a true masticatory lobe. The 3 distal joints form together a very movable terminal part or palp, which is about the length of the basal part, and is generally extended obliquely behind, almost at a right angle with the former. Its 1st joint is rather broad at the base, gradually tapering distally, and is clothed with several ciliated setæ on both edges. The 2nd joint is of about the same length, but much narrower, subcylindric in form,

Digitized by Google

and carries one ciliated seta behind, and 2 in front. The last joint is very small and carries, on the tip, 2 slender claws of somewhat unequal size, and in front of them a simple bristle.

The succeeding pair of limbs (fig. 4) are considerably longer than the preceding pair, and have the basal joint quite simple, without any spiniferous projection at the end, but provided there with only 2 plumose setæ. The terminal part is almost 3 times as long as the basal one, and is divided into 4 well-defined joints; it otherwise resembles in structure that of the preceding pair, and is likewise generally extended obliquely behind.

The last pair of limbs (fig. 5) are very small and simple in structure, extending, as a rule, obliquely upwards across the sides of the abdominal portion of the body. They each form a slightly tapered stem, exhibiting an imperfectly defined, small terminal joint, which carries 2 very slender setæ, one of which is more than twice as long as the stem. The function of these limbs cannot be locomotory, since they do not admit of being extended from the shell, whereas they most probably serve the same purpose as the peculiarly modified last pair of limbs in the *Cypridinidæ*, viz., that of cleansing the body from foreign matter introduced into the shell-cavity.

The caudal lamellæ (comp. fig. 10) are not very large, and are of semi-circular form, being movably articulated to the end of the abdominal division. They are not exactly juxtaposed, the one advancing somewhat beyond the other; and each is armed with 8 slender claws, rapidly increasing in length distally, the foremost claw being considerably elongated, and placed at some distance from the others. The claws are finely denticulated along their concave edge, and are movably articulated to the plate, which projects between them in small dentiform processes. At some distance behind the claws, 2 very small juxtaposed bristles occur.

The adult male (Pl. XXXV, fig. 3) is easily recognizable from the female, both as regards the shell and the enclosed animal.

The shell measures 3·20 mm. in length, and is accordingly somewhat smaller than that of the female. Seen laterally (fig. 3), it also appears rather narrower, with the posterior extremity more obliquely truncated, and the upper posterior corner somewhat more prominent. The ventral margin, moreover, is more distinctly sinuated in the middle.

Digitized by Google

The frontal tentacle (see Pl. XXXVI, fig. 6) has the capitulum more tumefied, and very sharply marked off from the rod-like peduncle, which appears to be divided into 2 segments.

The antennulæ (ibid.) are much more powerfully built than in the female, and the joints are more sharply marked off from each other. The musculation is also stronger, indicating a freer mobility of these limbs, the muscles occupying the 2nd joint, and acting upon the terminal part, being especially conspicuous. The slender seta issuing from the upper edge of this joint in the female is replaced by a short hook-like spine, curving inwards. The apical appendages are present in the same number as in the female; but they are all more or less transformed. The foremost seta is very strong, and has the distal 3rd part abruptly bent downwards, the median part being thickened, and armed below with recurved spinules. Of the 4 uniform sensory filaments present in the female, only 2 have retained their sensory character, the hindmost exhibiting, however, a peculiar twisted form, and extending straight behind. In the present species, these 2 sensory appendages are of about equal size, whereas in other species their length is rather different. The 2 remaining appendages have both assumed the character of slender setæ, much longer than the 2 above-mentioned sensory appendages, though not nearly attaining the length of the foremost seta. On a closer examination, only 3 of these appendages are seen to issue from the last joint, whereas the other 2, one sensory and one setiform, are attached inside the penultimate joint.

The antennæ resemble in structure those in the female, as regards the basal part and the natatory ramus. On the other hand, the accessory ramus is conspicuously transformed, and developed into a prehensile organ, terminating in an anteriorly-curving claw, in addition to the apical appendages. This claw is much larger on the right (fig. 7) than on the left antenna (fig. 8), and a similar asymmetry is also found in the other species, probably having some relation to the asymmetrical arrangement of the genital apparatus.

Of the other limbs, only the penultimate pair, or the 2nd pair of legs (fig. 9), differ somewhat from those in the female. They are, on the whole, more powerfully developed, and each carry at the tip, 3 very long and densely ciliated setæ, which are all of exactly the same size, and lie close together,

Digitized by Google

all being gently curved below. As these limbs are generally extended straight behind, the ends of the apical setæ are most frequently seen projecting from the hind edges of the shell (see Pl. XXXV, fig. 3).

On the left side of the abdominal part of the body, at some distance from the caudal plates, a rather large, oblong oval piece occurs, projecting freely below, and somewhat anteriorly (see Pl. XXXV, fig. 3, Pl. XXXVI, figs. 10, 11). This is the single copulative organ, containing the outer part of the seminal duct.

The inner organs cannot, of course, be very closely examined, except in fresh specimens. However, by a suitable preparation of the extracted body, it can be made sufficiently pellucid to show some of these organs rather distinctly (see Pl. XXXV, figs., 1, 3). The intestine especially is easy to observe, forming a very capacious sac-like cavity, located in the abdominal part of the body, and generally filled with contents of an opaque, dark appearance. It debouches by a short rectum between the caudal lamellæ, and to its anterior extremity leads a highly muscular œsophagus, ascending obliquely from the oral aperture. By dissection, this part of the intestinal tract is not infrequently obtained in connection with the chitinous skeleton surrounding the mouth, and can thus be subjected to a closer examination (see Pl. XXXVI, fig. 1). It is coarsely annulated throughout, and is attached to the walls of the body by numerous short muscles. Its distal extremity expands into a large hollow disc, which projects freely within the lumen of the intestinal cavity. The contents of the latter consist of a compact infiltrated mass, in which I have failed to detect any recognizable remains, either of algæ or of animals. Probably the food is so finely triturated by the mandibles, that no part of it is left unaltered.

In the female, the ovaries also, with their numerous egg-follicles, may be pretty clearly traced, owing to their opaque white colour, contrasting strongly with the dark contents of the intestine (see Pl. XXXV, fig. 1).

The young do not seem to undergo any metamorphosis, all the limbs being present, even in specimens which have evidently just escaped from the ova. The shell of the young animal, however, is rather different in shape from that of the adult animal, being far less elongated, and in

Digitized by Google

very small specimens almost globular, gradually assuming a more oval form (see Pl. XXXVI, fig. 12).

Occurrence. This form was found very abundantly in the greater number of the samples (12), and it was taken both from the surface and from depths down to 300 metres.

Distribution. Off Greenland, in lat. 74° 49′ N., long. 11° 30′ W. from a depth of 350 fathoms; Faröe channel, in lat. 60° 20′ N., long, 7° 23′ W. from a depth of 200 fathoms, cold area.

CIRRIPEDIA.

Some Cirripedia-larvæ in the characteristic so-called Cypris-stage, apparently belonging to a species of *Balanus*, were found in a sample taken October 13th, 1893, north of the New Siberian Islands.

CHRISTIANIA. *January* 1900.

G. O. SARS.

Digitized by Google

TABLE OF CONTENTS.

	Page.	Plate.
Introduction	3	
Account of the species	13	
PODOPHTHALMIA.		
Fam. CRANGONIDÆ.		
1. *Sabinea septemcarinata* (Sab.)	13	
Fam. EPHYRIDÆ.		
2. *Hymenodora glacialis* (Buchholtz)	13	
Fam. EUPHAUSIIDÆ.		
3. *Nyctiphanes norvegicus* (M. Sars)	13	
4. *Thysanoëssa longicaudata* (Krøyer)	14	
AMPHIPODA.		
Fam. HYPERIIDÆ.		
1. *Euthemisto libellula* (Mandt.)	14	
2. *Parathemisto oblivia* (Krøyer)	14	
Fam. LANCEOLIDÆ.		
Gen. *Lanceola*, Say	14	
3. *Lanceola Clausi*, Bovallius	15	I.
Fam. SCINIDÆ.		
4. *Scina borealis*, G. O. Sars	19	
Fam. LYSIANASSIDÆ.		
Gen. *Cyclocaris*, Stebbing	19	
5. *Cyclocaris Guilelmi*, Chevreux	20	II, III.

Digitized by Google

		Page.	Plate.
	Gen. *Pseudalibrotus*, Della Valle	25	
6.	*Pseudalibrotus Nanseni*, n. sp.	26	IV, V.
7.	*Pseudalibrotus glacialis*, n. sp.	31	VI.
	Fam. PARAMPHITHOIDÆ.		
8.	*Paramphithoë brevicornis*, G. O. Sars	32	
	Fam. AMPELISCIDÆ.		
9.	*Haploöps tubicola*, Lilljeborg	32	
10.	*Haploöps setosa*, Boeck	33	
	Fam. STENOTHOIDÆ.		
11.	*Metopa longicornis*, Boeck	33	
	Fam. EUSIRIDÆ.		
12.	*Eusirus cuspidatus*, Kröyer	33	
13.	*Eusirus Holmi*, Hansen	33	
	Fam. CALLIOPIDÆ.		
14.	*Amphilhopsis glacialis*, Hansen	33	
	Fam. GAMMARIDÆ.		
15.	*Gammarus locusta*, Lin., var. *mutata*	34	
16.	*Amathilla pinguis* (Kröyer)	34	
	ISOPODA.		
	Tribe: EPICARIDA.	34	
	COPEPODA.		
	Division: *CALANOIDA.*		
	Tribe: AMPHASKANDRIA.		
	Fam. CALANIDÆ.		
1.	*Calanus finmarchicus*, (Gunner.)	35	
2.	*Calanus hyperboreus*, Kröyer	35	
	Fam. SCOLECITHRICIDÆ.		
	Gen. *Scaphocalanus*, n.	35	
3.	*Scaphocalanus acrocephalus*, n. sp.	36	VII, VIII, IX.
	Gen. *Scolecithrix*, Brady	45	
4.	*Scolecithrix brevicornis*, n. sp.	46	X.
	Gen. *Xanthocalanus*, Giesbr.	48	
5.	*Xanthocalanus borealis*, n. sp.	49	XI.

Digitized by Google

		Page	Plate.
	Gen. ***Undinella***, n.		
6.	***Undinella oblonga***, n. sp.	52	XII, XIII.
	Fam. EUCHÆTIDÆ.		
7.	***Euchæta norvegica***, Boeck	58	XIV.
	Fam. ÆTIDIIDÆ.		
	Gen. ***Undeuchæta***, Giesbr.	58	
8.	***Undeuchæta spectabilis***, n. sp.	59	XV, XVI.
	Gen. ***Chiridius***, Giesbr.		
9.	***Chiridius armatus*** (Boeck)	64	XVII.
10.	***Chiridius tenuispinus***, n. sp.	67	XVIII.
11.	***Chiridius brevispinus***, n. sp.	68	XIX.
	Fam. PSEUDOCALANIDÆ.		
	Gen. ***Pseudocalanus***, Boeck	69	
12.	***Pseudocalanus elongatus***, Boeck	69	
13.	***Pseudocalanus major***, n. sp.	69	XX.
14.	***Pseudocalanus pygmæus***, n. sp.	73	XXI.
	Gen. ***Spinocalanus***, Giesbr.	75	
15.	***Spinocalanus longicornis***, n. sp.	75	XXII.
16.	***Drepanopus Bungei***, G. O. Sars	78	
	Tribe: HETERARTHRANDRIA.		
	Fam. HETEROCHÆTIDÆ.		
	Gen. ***Heterochæta***, Claus	79	
17.	***Heterochæta norvegica***, Boeck	79	XXIII.
18.	***Heterochæta compacta***, n. sp.	83	XXIV, XXV.
	Gen. ***Augaptilus***, Giesbr.	87	
19.	***Augaptilus glacialis***, n. sp.	88	XXVI, XXVII.
	Gen. ***Hemicalanus***, Claus	94	
20.	***Hemicalanus spinifrons***, n. sp.	95	XXVIII.
	Fam. TEMORIDÆ.		
	Gen. ***Metridia***, Boeck	99	
21.	***Metridia longa*** (Lubbock)	99	XXIX.
	Gen. ***Temorites***, n.	100	
22.	Temorites brevis, n. sp.	100	XXX, XXXI.
	Fam. ACARTIIDÆ.		
23.	***Acartia longiremis*** (Lilljeb.)	106	

Digitized by Google

		Page.	Plate.
	Division: *CYCLOPOIDA.*		
	Tribe: ISOKERANDRIA.		
	Fam. ONCÆIDÆ.		
	Gen. *Oncæa*, Philippi	106	
24.	*Oncæa notopus*, Giesbrecht	107	XXXII, figs. 1—14.
25.	*Oncæa conifera*, Giesbrecht	113	XXXII, figs. 15, 16.
	Gen. *Lubbockia*, Claus.		
26.	*Lubbockia glacialis*, n. sp.	114	XXXII
	Tribe: AMPHARTHRANDRIA.		
	Fam. OITHONIDÆ.		
	Gen. *Oithona*, Baird	119	
27.	*Oithona helgolandica*, Claus.	119	
	Fam. MORMONILLIDÆ.		
	Gen. *Mormonilla*, Giesbr.	119	
28.	*Mormonilla polaris*, n. sp.	120	XXXV.
	OSTRACODA.		
	Tribe: MYODOCOPA.		
	Fam. CONCHOŒCIIDÆ.		
	Gen. *Conchœcia*, Dana	127	
	Conchœcia maxima, Brady & Norm.	127	XXXV, XXXVI.
	CIRRIPEDIA.	137	

Digitized by Google

١٤٠٧

Digitized by Google

PLATE I.

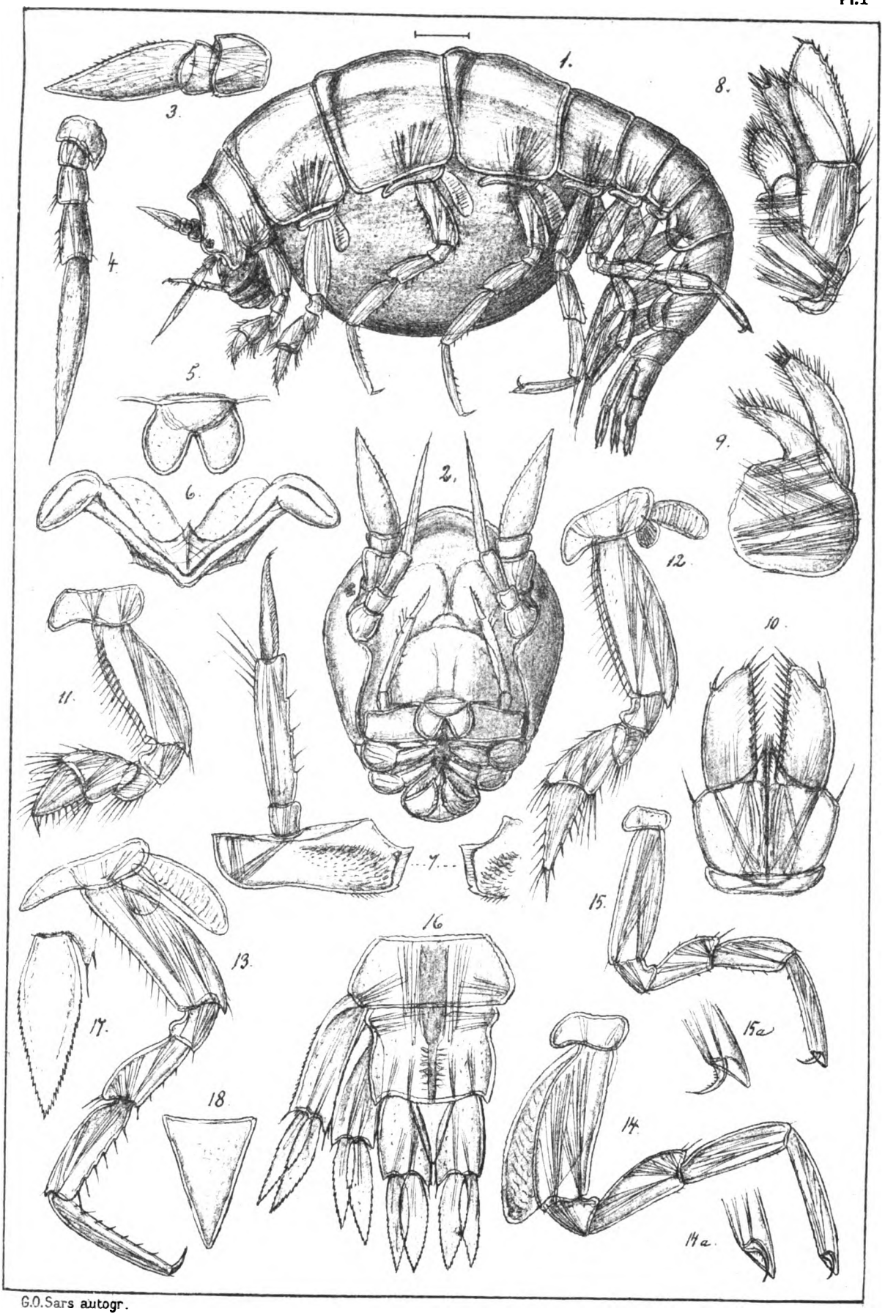
Digitized by Google

PLATE I.

Lanceola Clausi, Bovallius.

Fig. 1. Female (not fully adult), viewed from left side.
— 2. Cephalon, front view, showing the antennæ and oral parts.
— 3. Superior antenna.
— 4. Inferior antenna.
— 5. Anterior lip.
— 6. Posterior lip.
— 7. Right mandible with palp, and masticatory part of left, viewed from the inner face.
— 8. Anterior maxilla.
— 9. Posterior maxilla.
— 10. Maxillipeds.
— 11. First gnathopod.
— 12. Second gnathopod.
— 13. First pereiopod.
— 14. Third pereiopod.
— 14a. Same, extremity of propodal joint, with the dactylus protracted.
— 15. Last pereiopod.
— 15a. Same, extremity of propodal joint, with the dactylus retracted.
— 16. Urosome, dorsal view (the 2 anterior uropoda on right side omitted).
— 17. Inner ramus of last uropod.
— 18. Telson.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmauling Chra.

Digitized by Google

Digitized by Google

PLATE II.

Digitized by Google

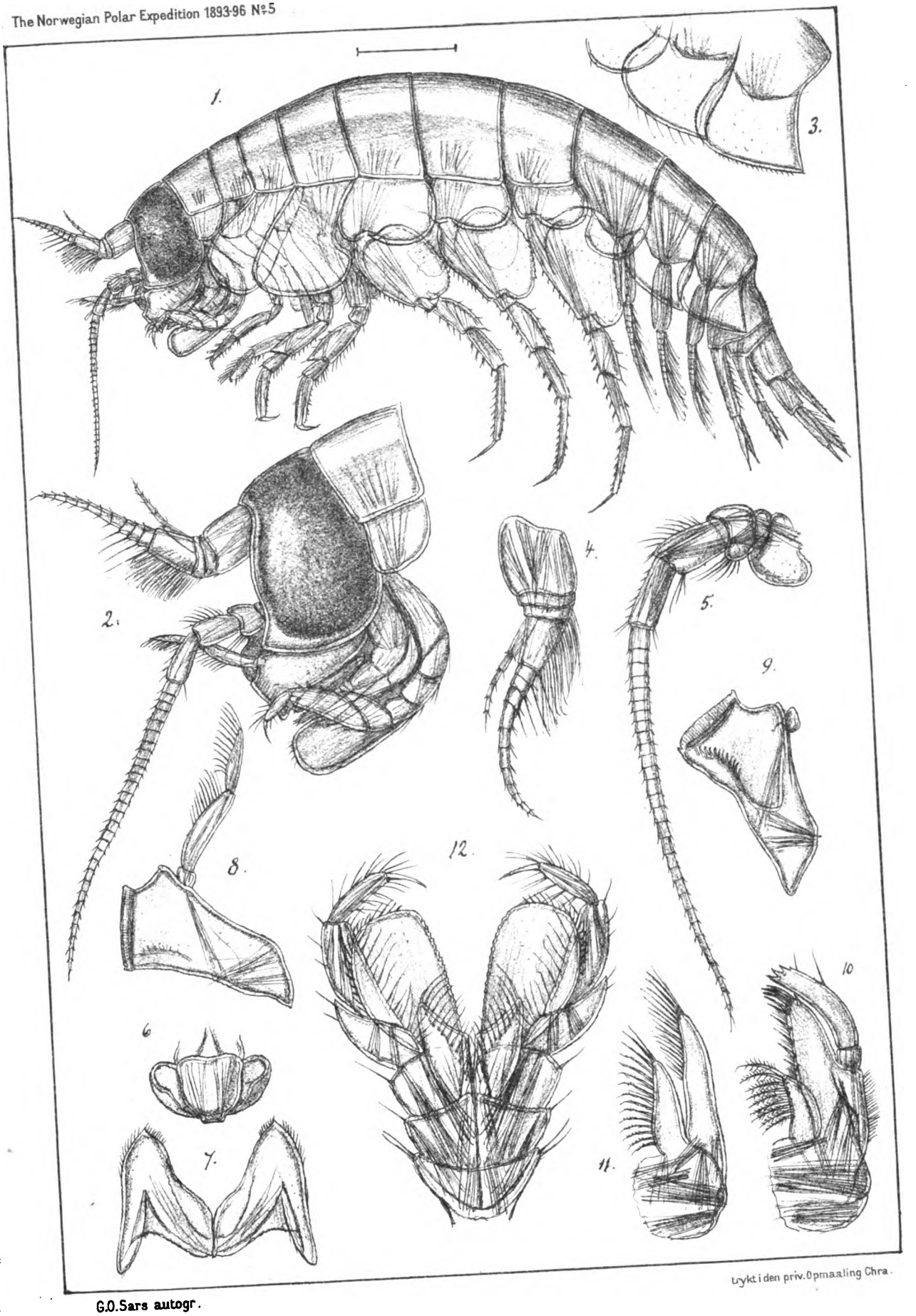
PLATE II.

Cyclocaris Guilelmi, Chevreux.

Fig. 1. Adult female, viewed from left side.
— 2. Cephalon with 1st segment of mesosome, lateral view.
— 3. Epimeral plates of metasome, viewed from left side.
— 4. Superior antenna.
— 5. Inferior antenna.
— 6. Anterior lip.
— 7. Posterior lip.
— 8. Left mandible with palp, viewed from the outer face.
— 9. Right mandible, without the palp, exhibited from the inner face.
— 10. Anterior maxilla.
— 11. Posterior maxilla.
— 12. Maxillipeds.

Digitized by Google

The Norwegian Polar Expedition 1893-96 N:o 5



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE III.

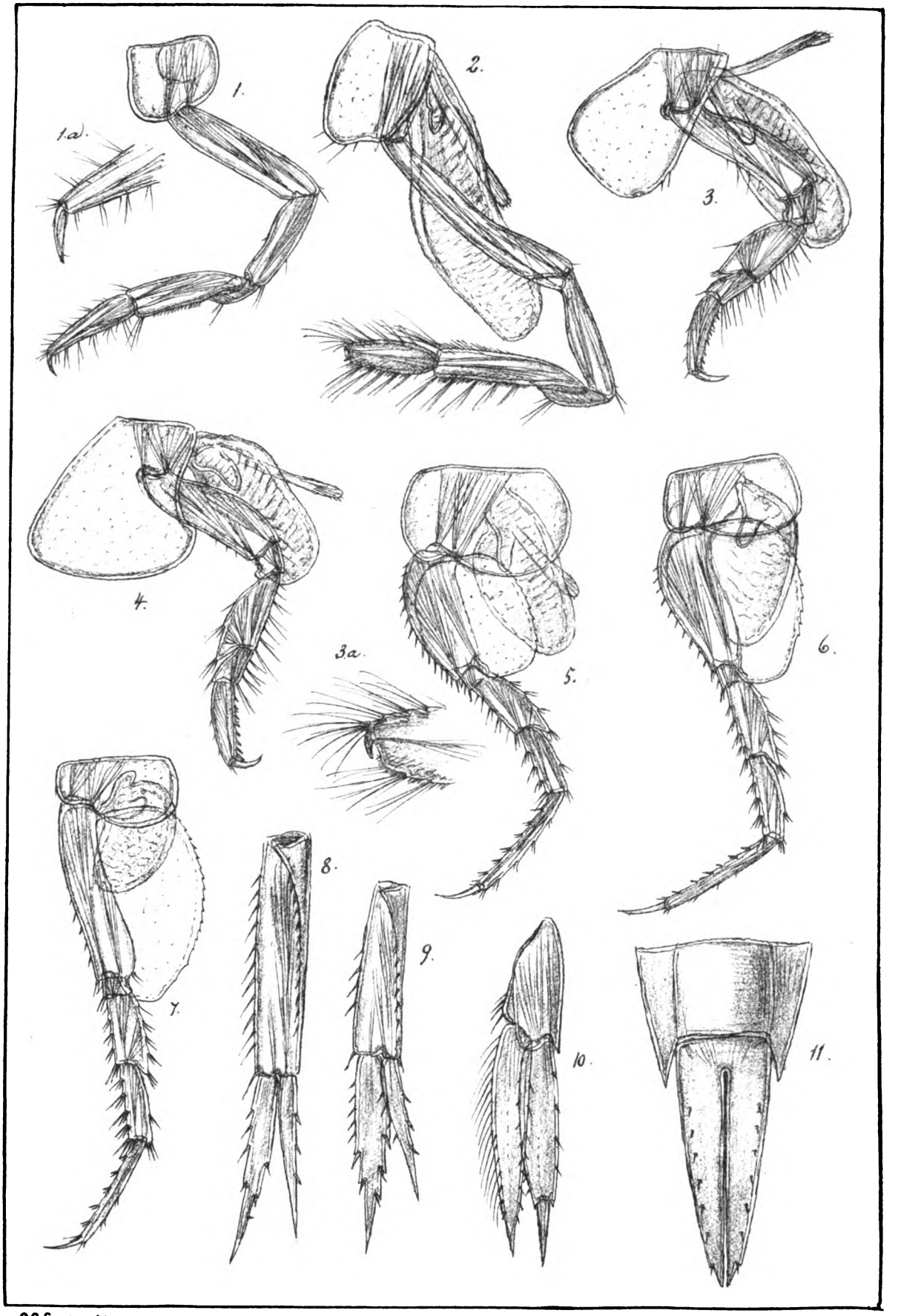
Digitized by Google

PLATE III.

Cyclocaris Guilelmi, Chevreux,
(continued).

Fig. 1. Anterior gnathopod.
— 1a. Same, extremity of propodos.
— 2. Posterior gnathopod.
— 2a. Same, extremity of propodos.
— 3. First pereiopod.
— 4. Second pereiopod.
— 5. Third pereiopod.
— 6. Fourth pereiopod.
— 7. Last pereiopod.
— 8. First uropod.
— 9. Second uropod.
— 10. Last uropod.
— 11. Terminal segment of urosome with telson, dorsal view.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE IV.

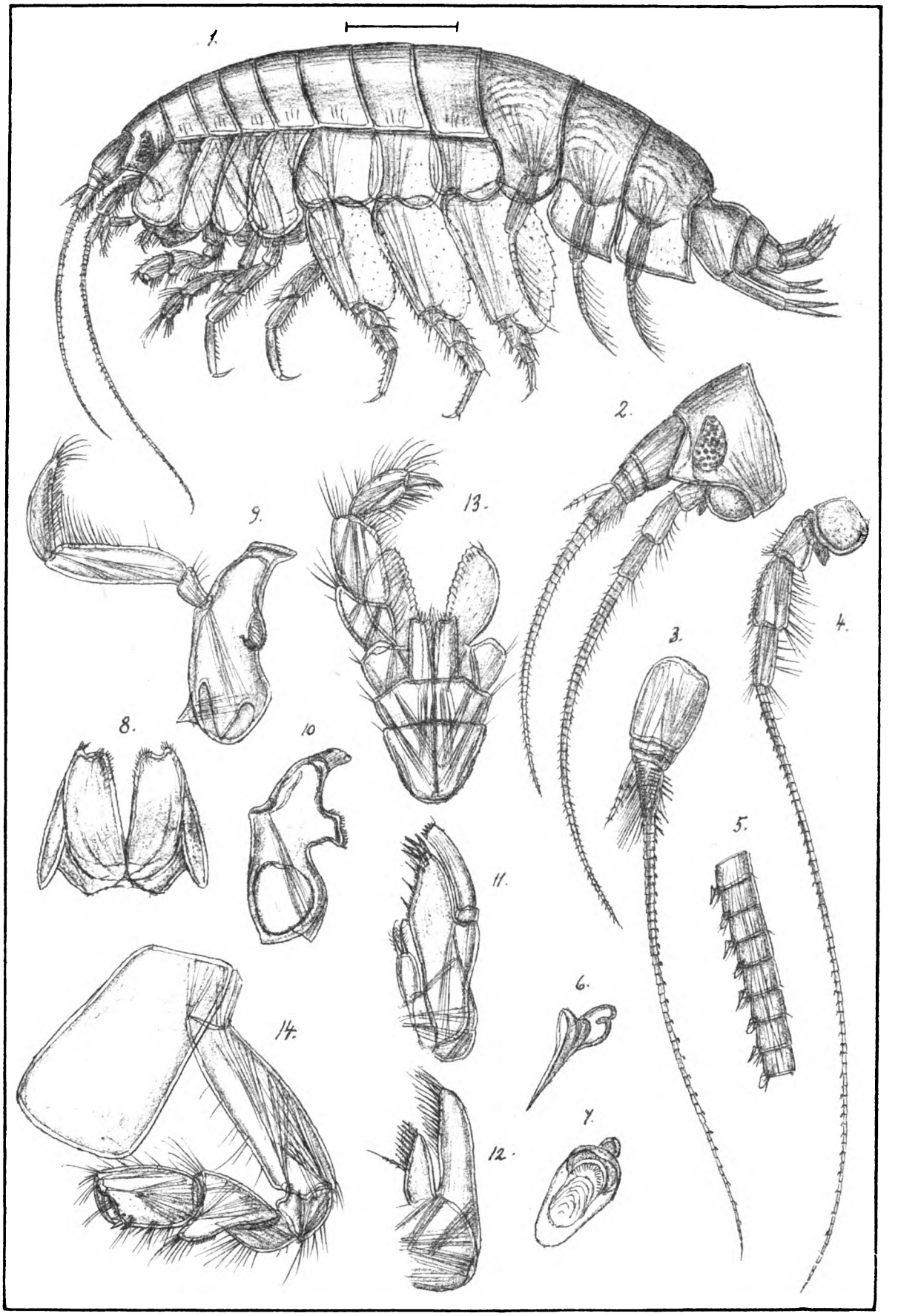
Digitized by Google

PLATE IV.

Pseudalibrotus Nanseni, G. O. Sars.

Fig. 1. Adult male, viewed from left side.
— 2. Cephalon of female, with antennæ, lateral view.
— 3. Superior antenna of male.
— 4. Inferior antenna of same.
— 5. Part of flagellum more highly magnified, showing the arrangement of the calceolæ.
— 6. A calceola highly magnified, lateral view.
— 7. Same, front view.
— 8. Posterior lip.
— 9. Left mandible with palp, viewed from inner face.
— 10. Same, without the palp, lateral view.
— 11. Anterior maxilla.
— 12. Posterior maxilla.
— 13. Maxillipeds.
— 14. Anterior gnathopod.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE V.

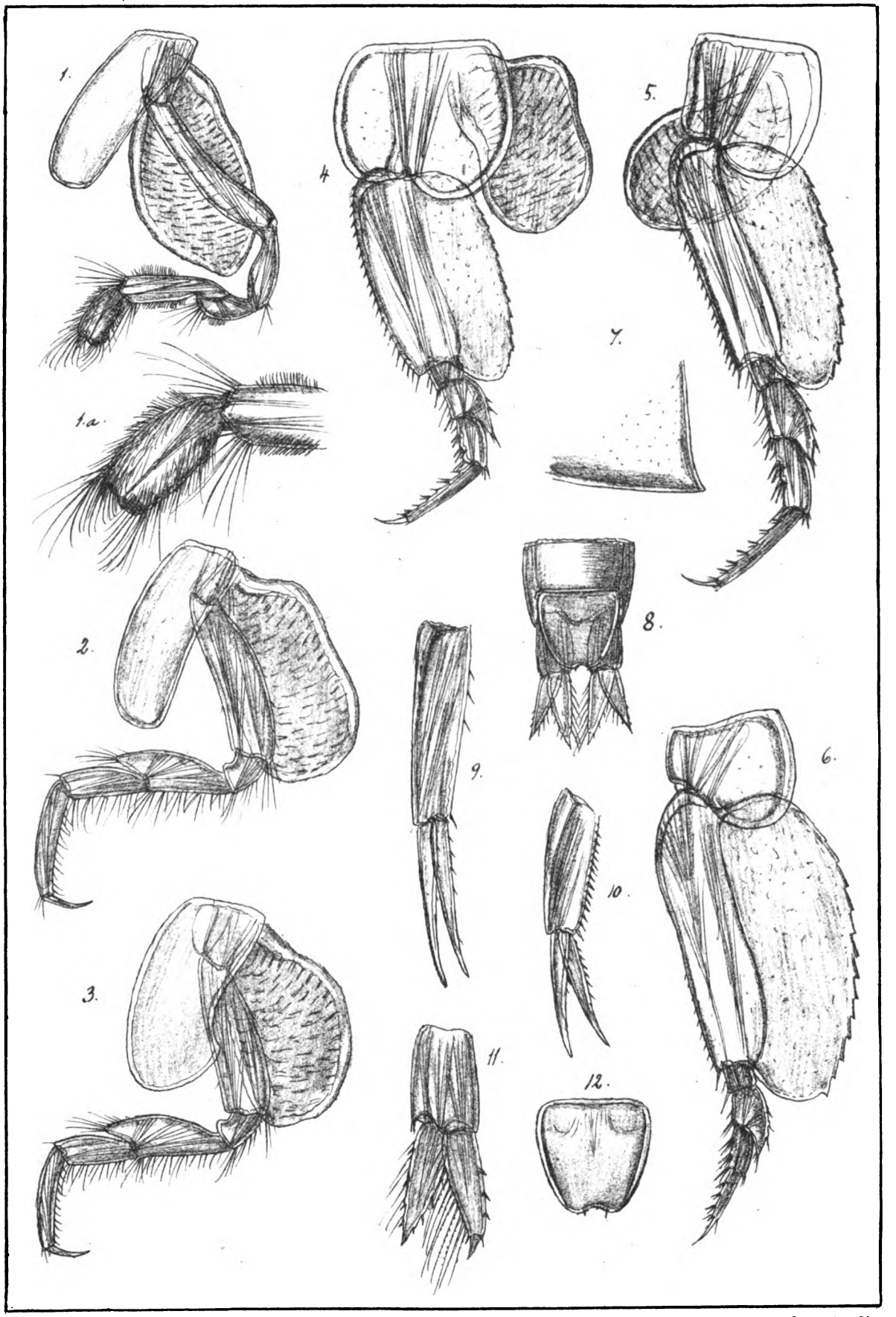
Digitized by Google

PLATE V.

Pseudalibrotus Nanseni, G. O. Sars,
(continued).

Fig. 1. Posterior gnathopod with branchial lamella.
— 1a. Extremity of same, more highly magnified.
— 2. First pereiopod.
— 3. Second pereiopod.
— 4. Third pereiopod.
— 5. Fourth pereiopod.
— 6. Last pereiopod.
— 7. Postero-lateral corner of last epimeral plate of metasome.
— 8. Terminal segment of urosome, with last pair of uropoda and telson; dorsal view.
— 9. First uropod.
— 10. Second uropod.
— 11. Last uropod.
— 12. Telson.

Digitized by Google



G.O.Sars autogr.

trykt i den priv.Opmaaling Chr.

Digitized by Google

Digitized by Google

PLATE VI.

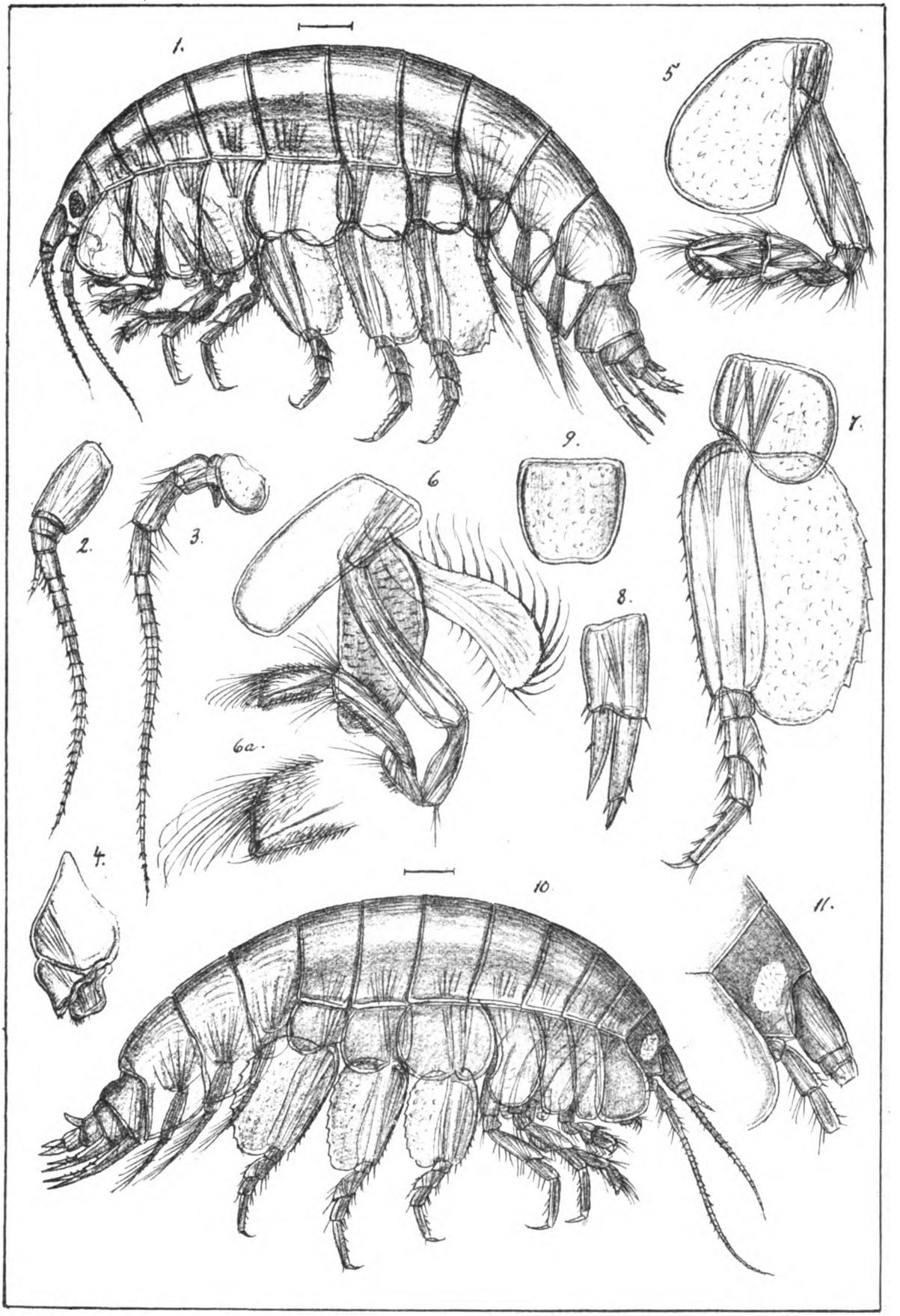
Digitized by Google

PLATE VI.

Pseudalibrotus glacialis, G. O. Sars.

Fig. 1. Adult female of the normal form, viewed from left side.
— 2. Superior antenna
— 3. Inferior antenna.
— 4. Anterior lip with epistome, viewed from left side.
— 5. Anterior gnathopod.
— 6. Posterior gnathopod, with branchial lamella and incubatory plate.
— 6a. Same, extremity of propodos, more highly magnified.
— 7. Last pereiopod.
— 8. Last uropod.
— 9. Telson.
— 10. Adult female of the variety *'leucopis'*, viewed from right side.
— 11. Anterior extremity of body, with the bases of the antennæ, lateral view.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chr.

Digitized by Google

Digitized by Google

PLATE VII.

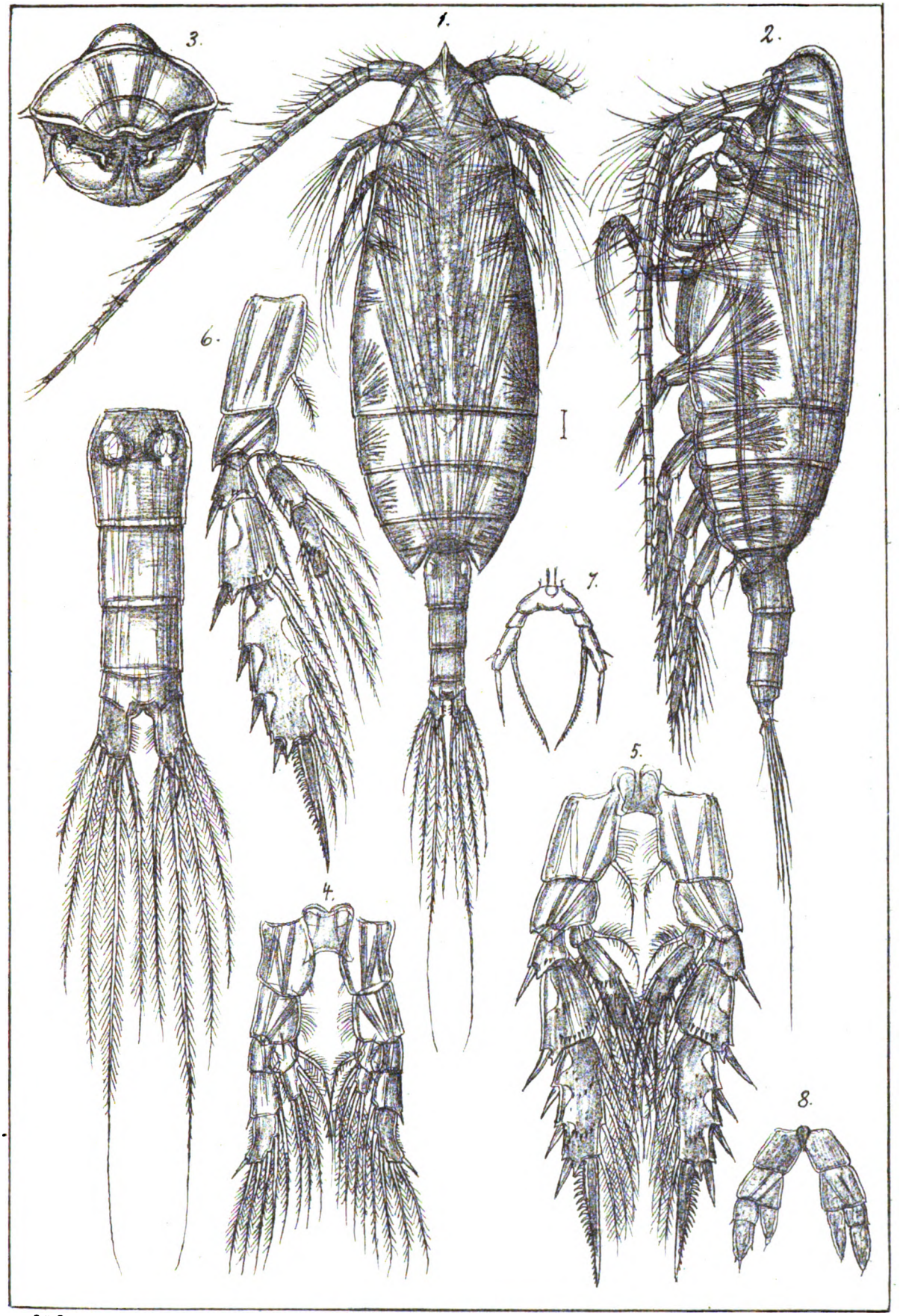
Digitized by Google

PLATE VII.

Scaphocalanus acrocephalus, G. O. Sars.

Fig. 1. Adult female, dorsal view (right anterior antenna not fully drawn).
— 2. Same, viewed from left side.
— 3. Anterior and posterior lips, ventral view.
— 4. First pair of natatory legs.
— 5. Second pair of natatory legs.
— 6. Natatory leg of 3rd pair.
— 7. Last pair of legs.
— 8. Same of a young male specimen.
— 9 (not numbered in the plate). Tail of female, dorsal view.

Digitized by Google



G.O.Sars autogr.

trykt i den priv. Opmaaling Chr.

Digitized by Google

Digitized by Google

PLATE VIII.

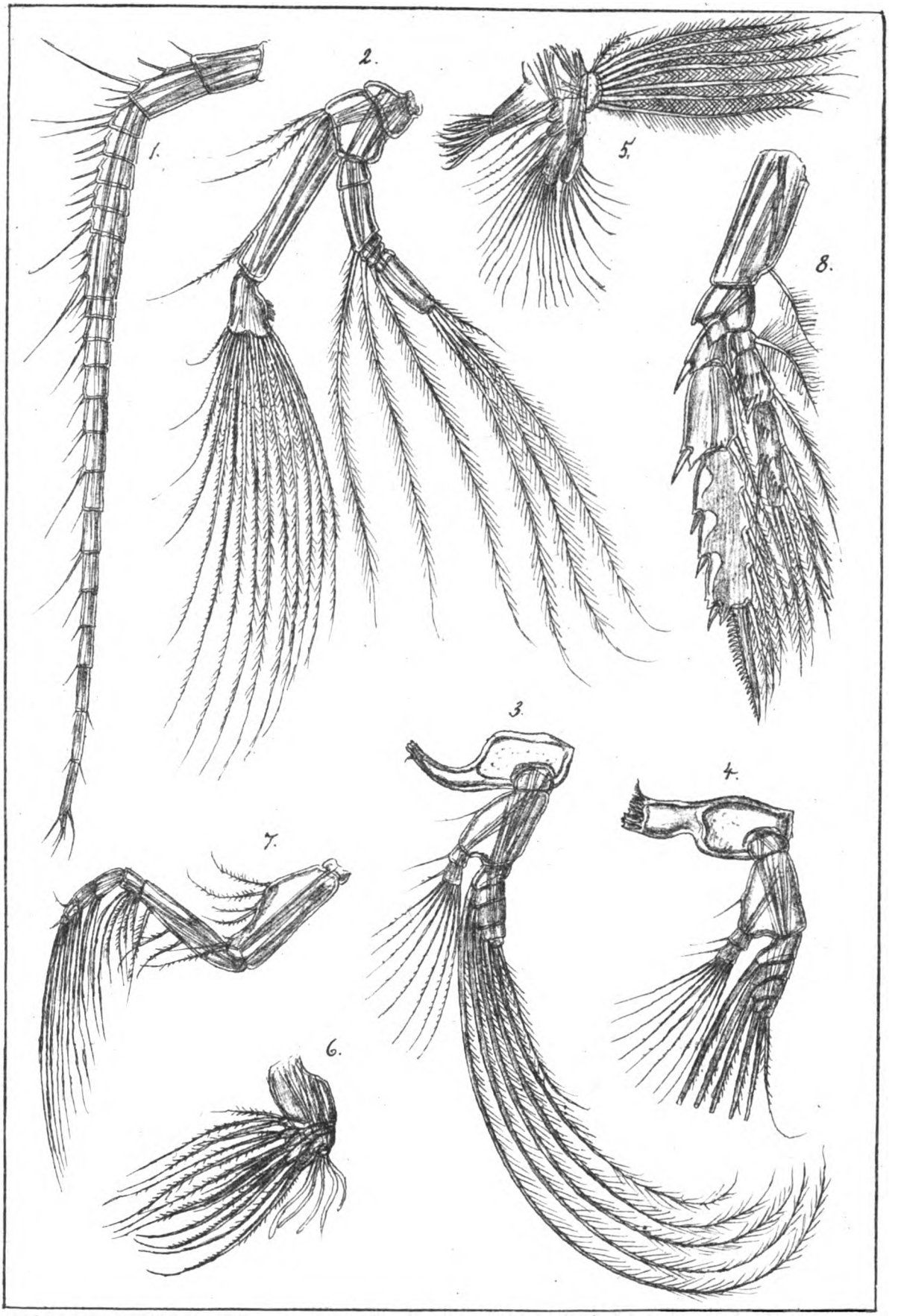
Digitized by Google

PLATE VIII.

Scaphocalanus acrocephalus, G. O. Sars.
(continued.)

Fig. 1. Anterior antenna.
— 2. Posterior antenna.
— 3. Mandible with palp (body viewed laterally).
— 4. Same, with the body viewed from the inner face (setæ of outer ramus of palp not fully drawn).
— 5. Maxilla.
— 6. Anterior maxilliped.
— 7. Posterior maxilliped.
— 8. Natatory leg of 4th pair.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chr.

Digitized by Google

Digitized by Google

PLATE IX.

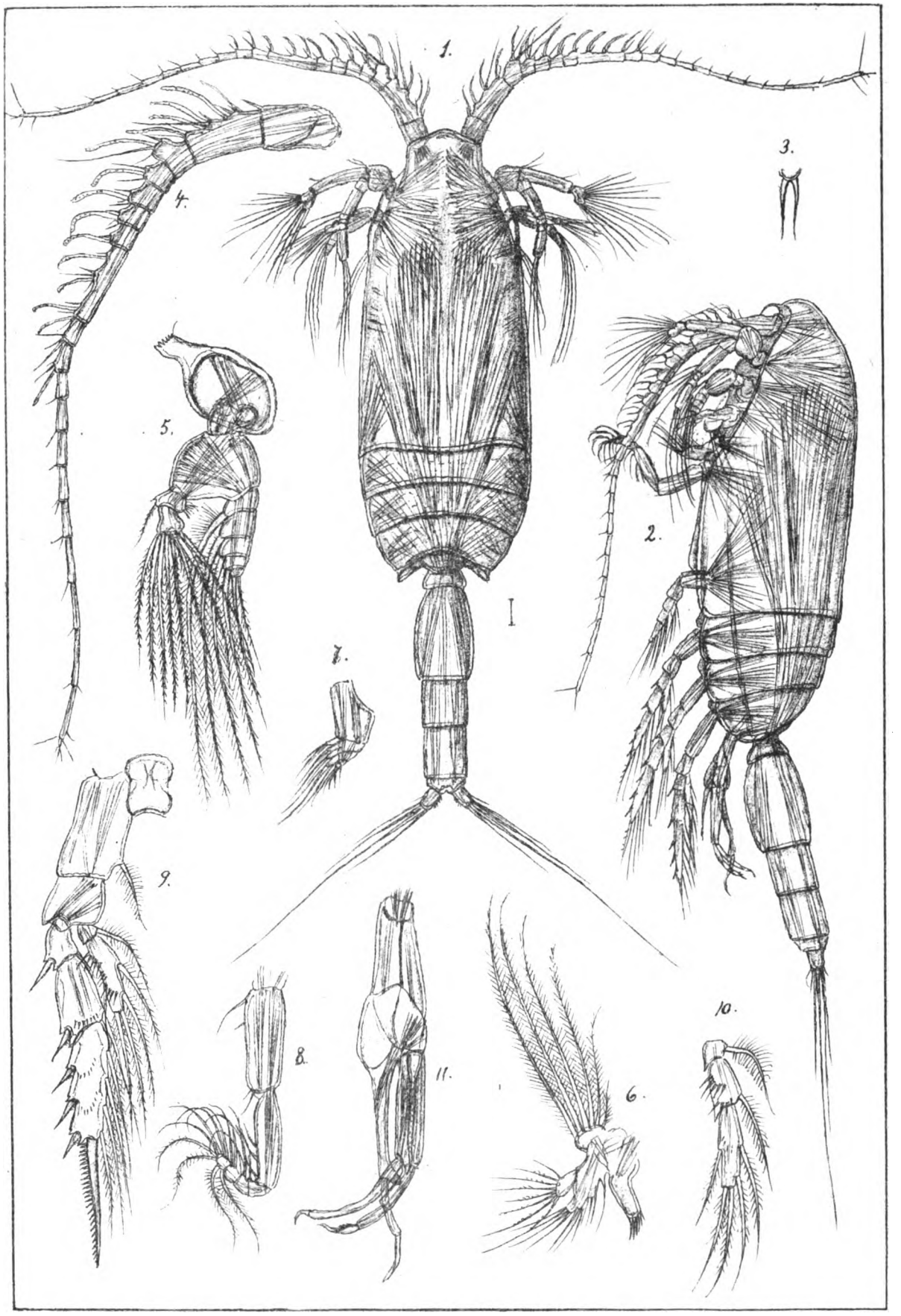
Digitized by Google

PLATE IX.

Scaphocalanus acrocephalus, G. O. Sars,
(adult male).

Fig. 1. A complete specimen, viewed from the dorsal face.
— 2. Same, lateral view.
— 3. Rostral prominence, with the tentacular filaments.
— 4. Anterior antenna.
— 5. Mandible with palp.
— 6. Maxilla.
— 7. Anterior maxilliped.
— 8. Posterior maxilliped.
— 9. Natatory leg of 2nd pair.
— 10. Inner ramus of a natatory leg of 4th pair.
— 11. Last pair of legs.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE X.

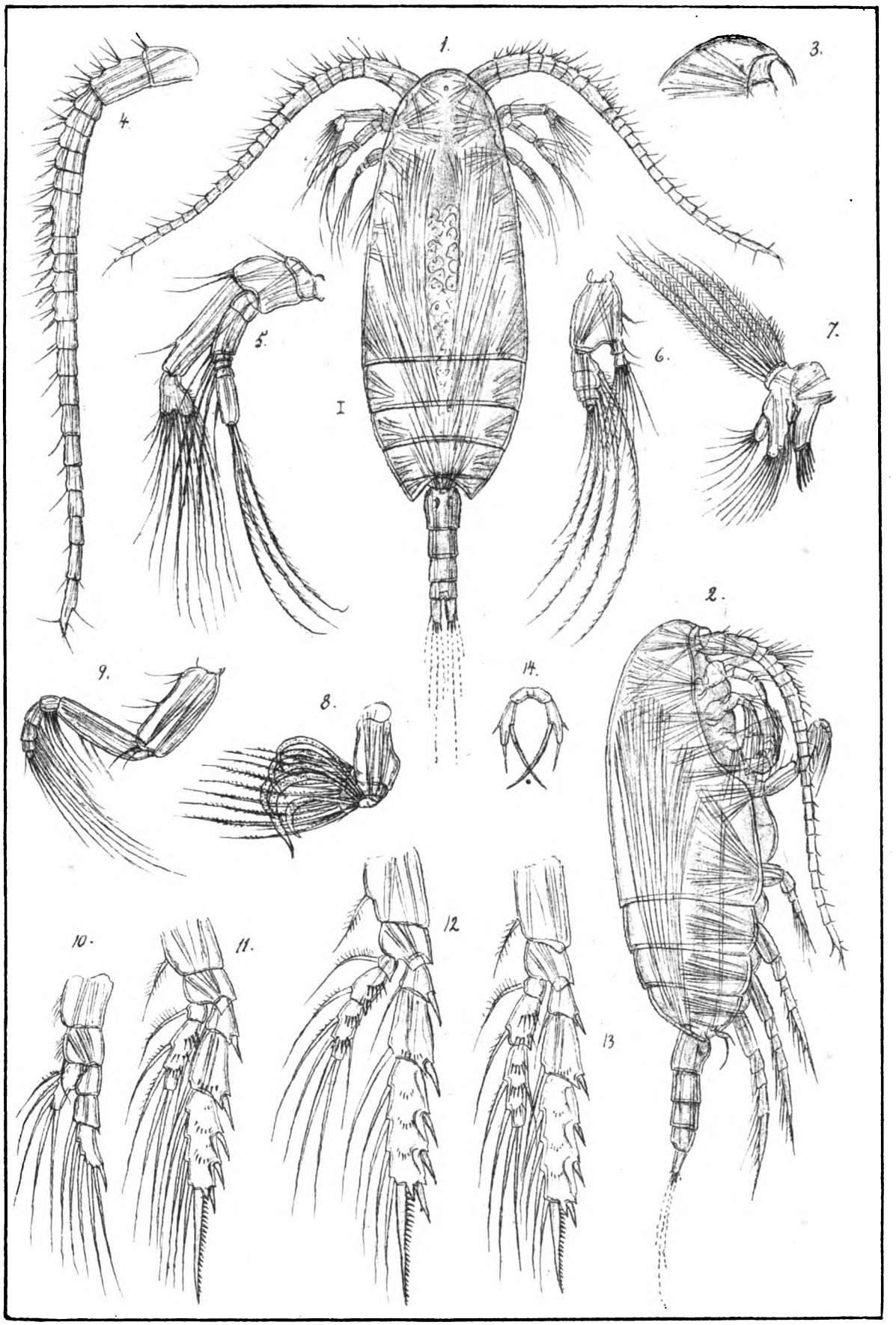
Digitized by Google

PLATE X.

Scolecithrix brevicornis, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from right side.
— 3. Frontal part of body, lateral view.
— 4. Anterior antenna.
— 5. Posterior antenna.
— 6. Mandibular palp.
— 7. Maxilla.
— 8. Anterior maxilliped.
— 9. Posterior maxilliped.
— 10. Natatory leg of 1st pair.
— 11. Do. of 2nd pair.
— 12. Do. of 3rd pair.
— 13. Do. of 4th pair.
— 14. Last pair of legs.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XI.

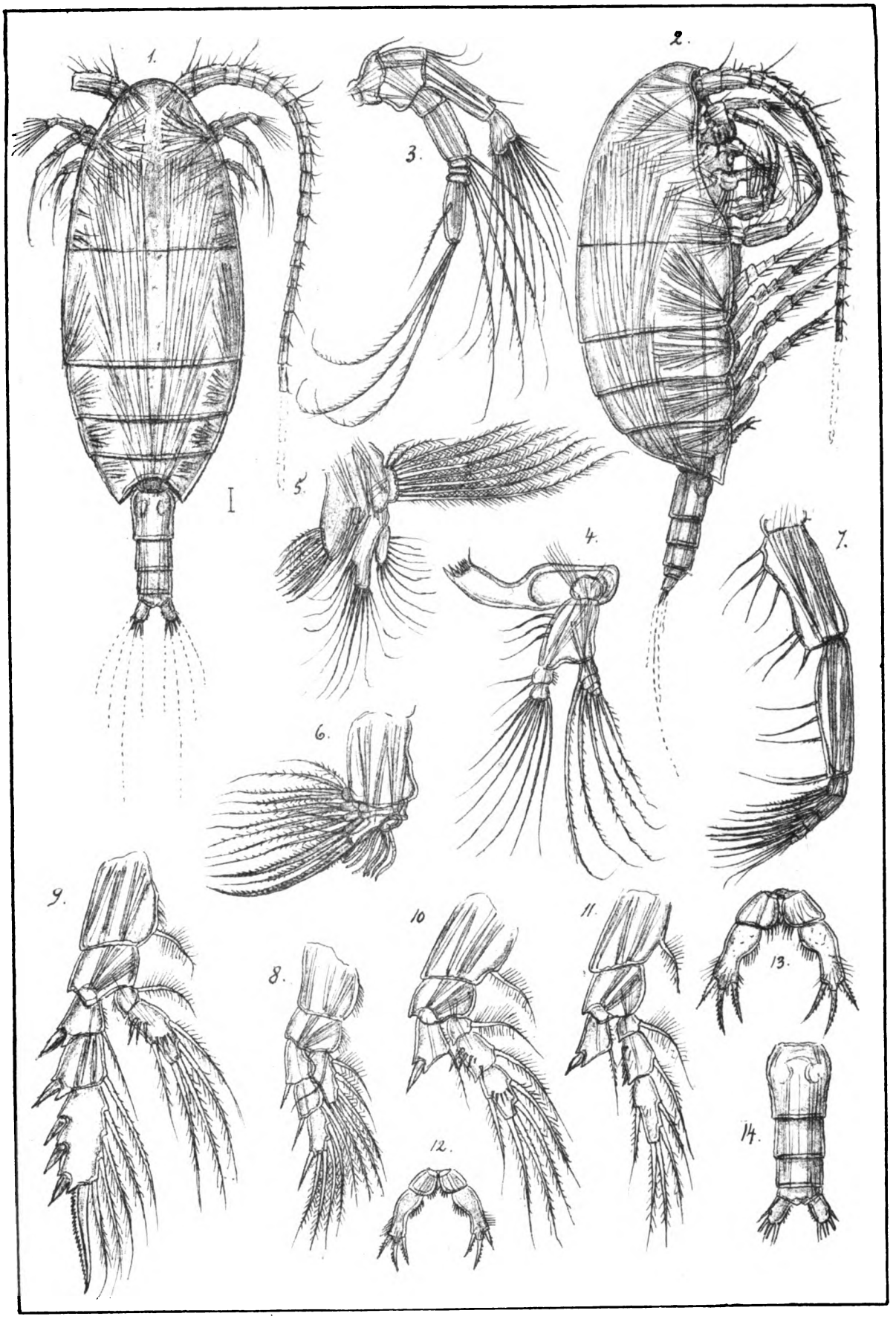
Digitized by Google

PLATE XI.

Xanthocalanus borealis, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from right side.
— 3. Posterior antenna.
— 4. Mandible with palp.
— 5. Maxilla.
— 6. Anterior maxilliped.
— 7. Posterior maxilliped.
— 8. Natatory leg of 1st pair.
— 9. Do. of 2nd pair.
— 10. Do. of 3rd pair.
— 11. Do. of 4th pair.
(Outer ramus in the last 2 figures not fully drawn.)
— 12. Last pair of legs.
— 13. Same, more highly magnified.
— 14. Tail, dorsal view (caudal setæ not fully drawn).

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XII.

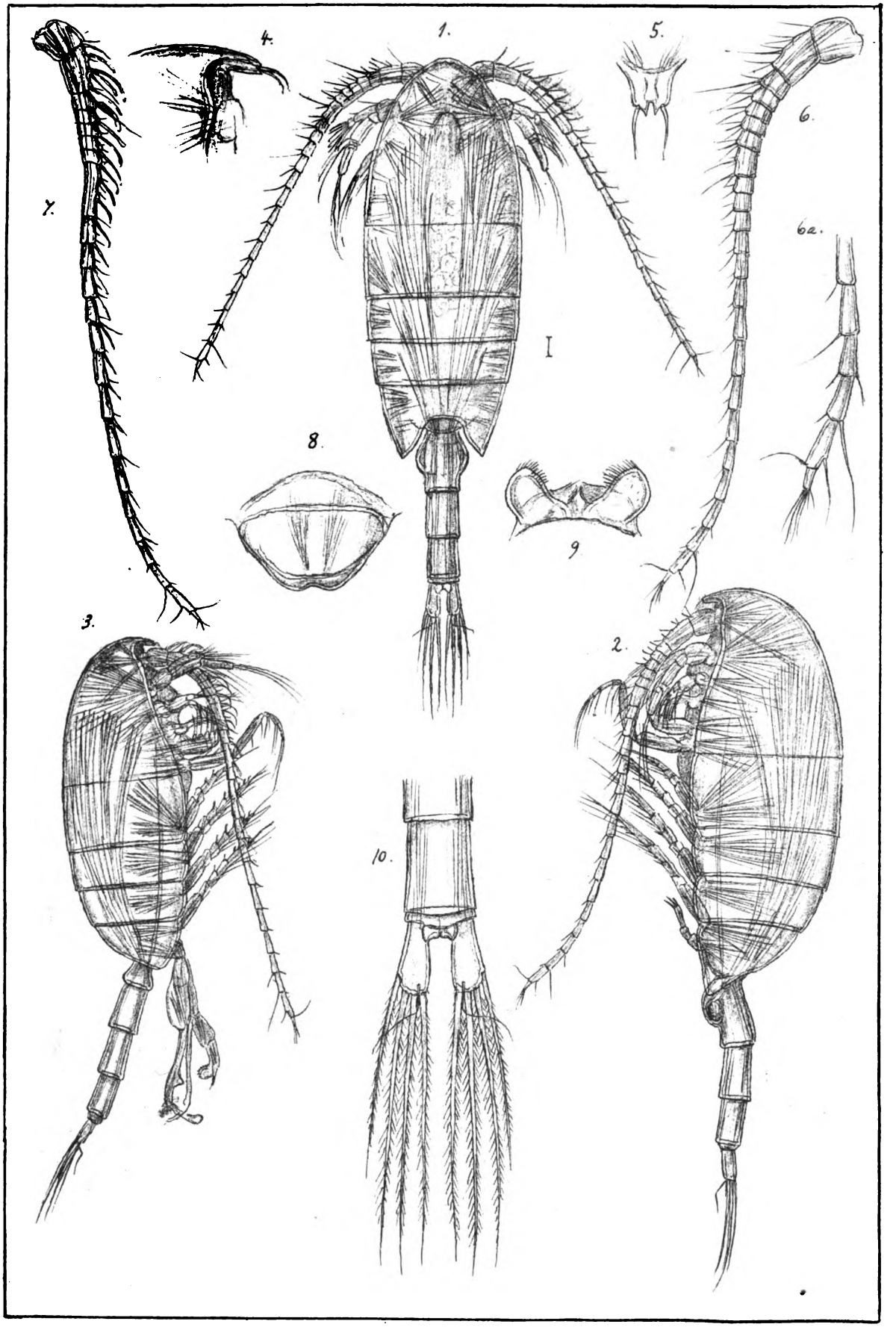
Digitized by Google

PLATE XII.

Undinella oblonga, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from left side.
— 3. Adult male, exhibited from right side.
— 4. Frontal part of body, lateral view.
— 5. Rostral prominence, front view.
— 6. Anterior antenna of female.
— 6a. Distal part of same, more highly magnified.
— 7. Anterior antenna of male.
— 8. Anterior lip.
— 9. Posterior lip.
— 10. Extremity of tail, dorsal view.

Digitized by Google



G.O.Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XIII.

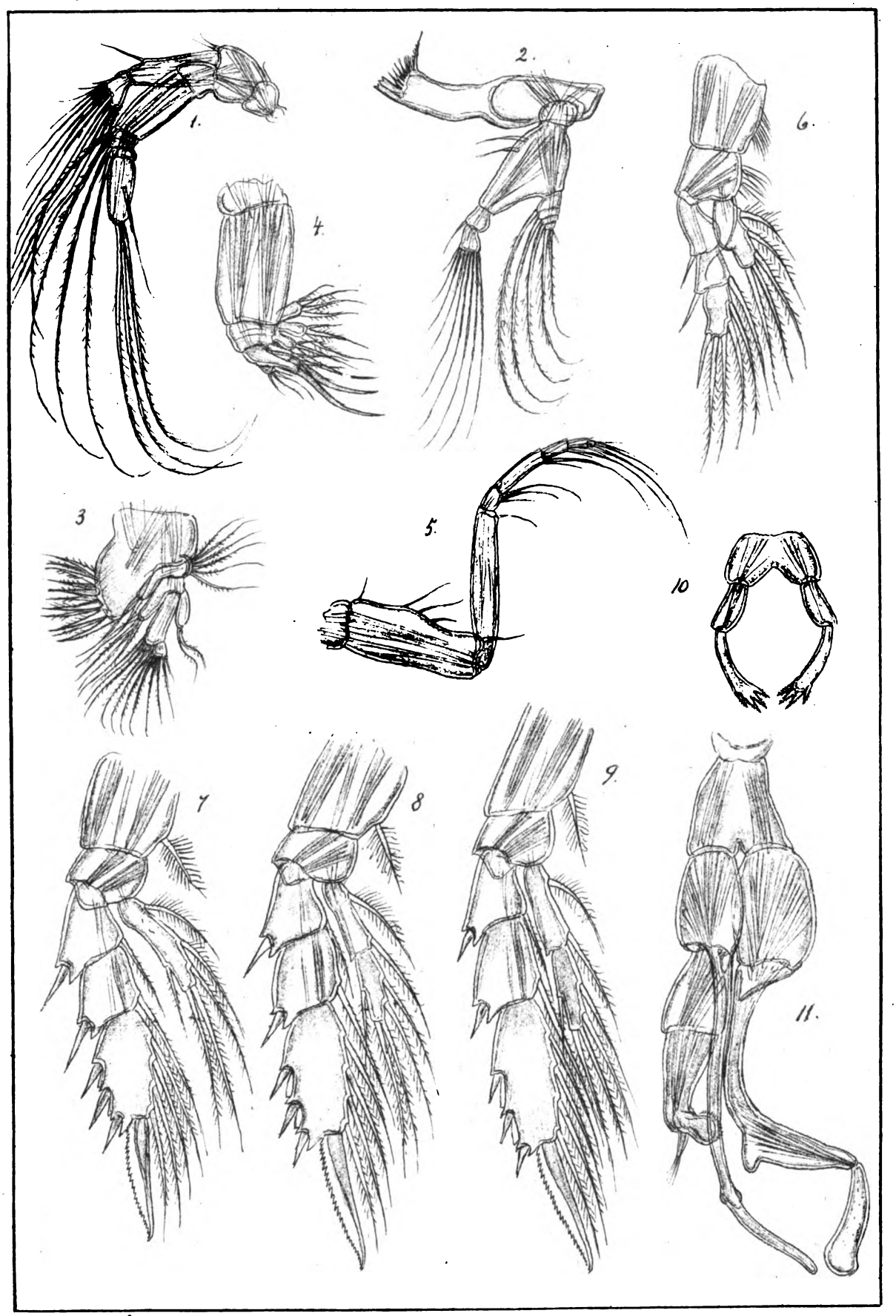
Digitized by Google

PLATE XIII.

Undinella oblonga, G. O. Sars,
(continued).

Fig. 1. Posterior antenna.
— 2. Mandible with palp.
— 3. Maxilla.
— 4. Anterior maxilliped.
— 5. Posterior maxilliped.
— 6. Natatory leg of 1st pair.
— 7. Do. of 2nd pair.
— 8. Do. of 3rd pair.
— 9. Do. of 4th pair.
— 10. Last pair of legs of female.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XIV.

Digitized by Google

PLATE XIV.

Euchæta norvegica, Boeck.

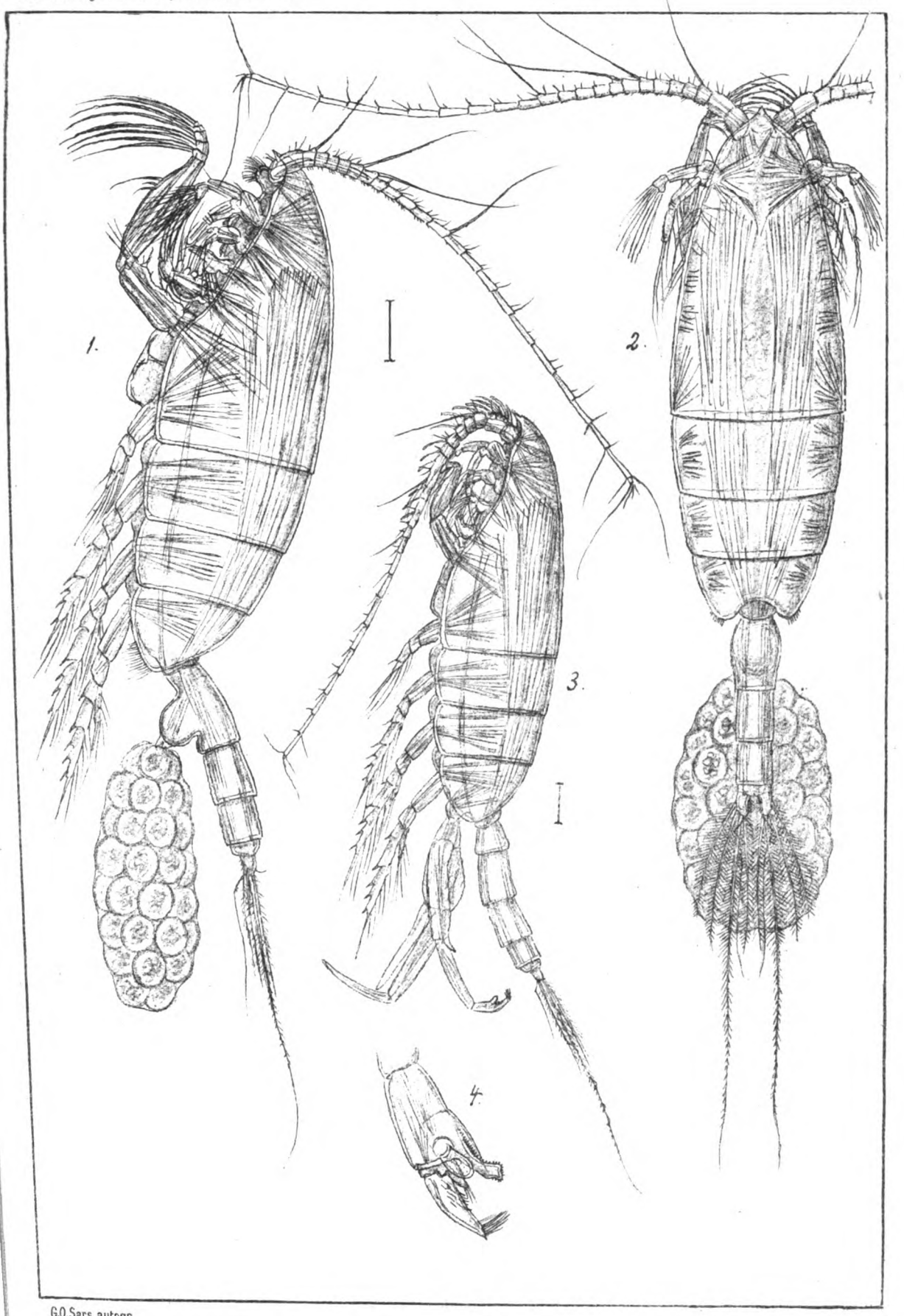
Fig. 1. Adult ovigerous female, viewed from left side.

— 2. Same, dorsal view.

— 3. Adult male, viewed from left side.

— 4. Same, distal part of left leg of last pair.

Digitized by Google



G.O.Sars autogr.

Trykt i den priv. Opmaaling Chra

Digitized by Google

Digitized by Google

PLATE XV.

Digitized by Google

PLATE XV.

Undeuchæta spectabilis, G. O. Sars.

Fig. 1. Adult female, dorsal view (right anterior antenna not fully drawn).

— 2. Same, viewed from left side.

— 3. Anterior antenna.

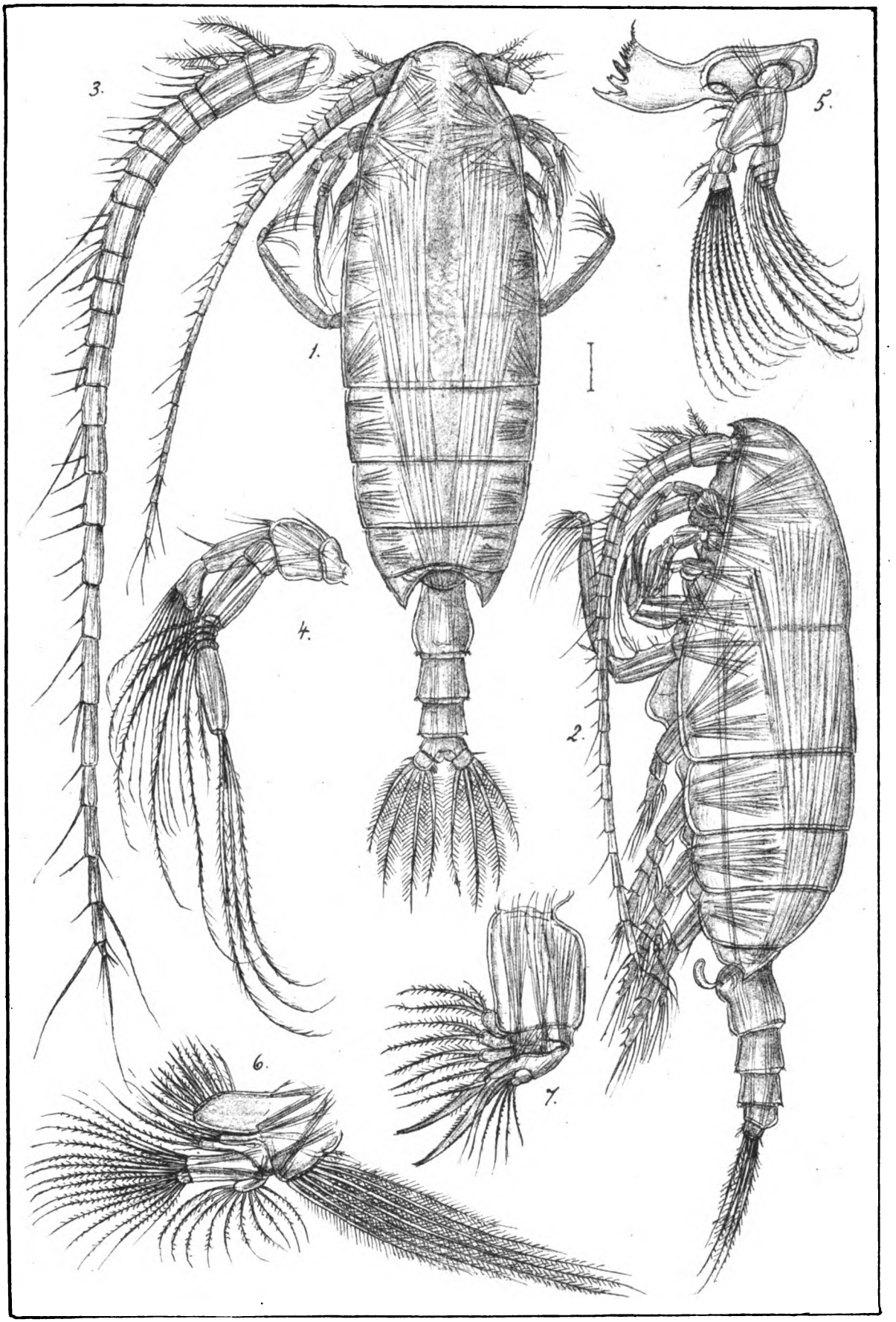
— 4. Posterior antenna.

— 5. Mandible with palp.

— 6. Maxilla.

— 7. Anterior maxilliped.

Digitized by Google



G.O. Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XVI.

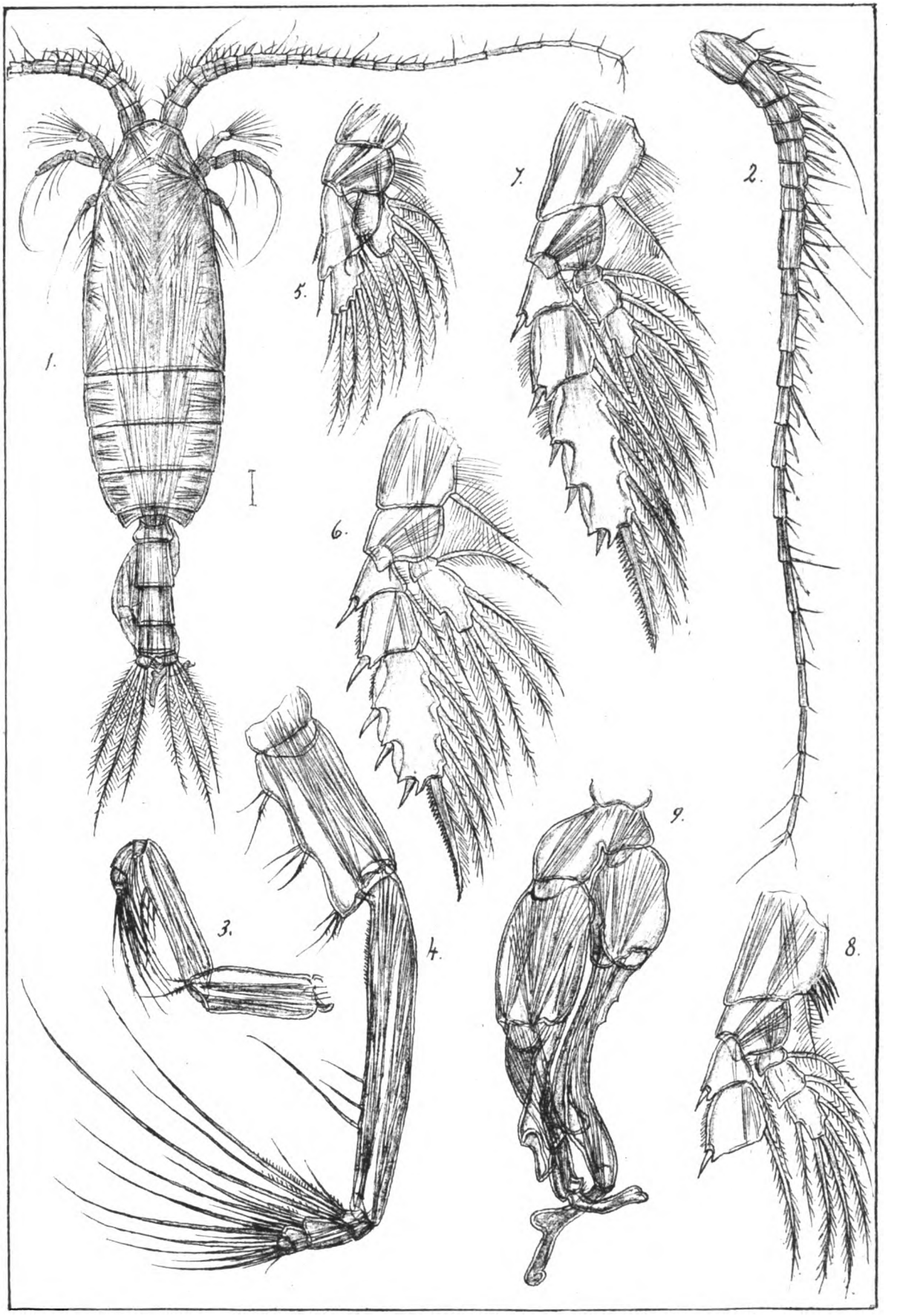
Digitized by Google

PLATE XVI.

Undeuchæta spectabilis, G. O. Sars,
(continued).

Fig. 1. Adult male, dorsal view.
— 2. Anterior antenna of same.
— 3. Posterior maxilliped of same.
— 4. Posterior maxilliped of female.
— 5. Natatory leg of 1st pair.
— 6. Do. of 2nd pair.
— 7. Do. of 3rd pair.
— 8. Do. of 4th pair (terminal joint of outer ramus not drawn).
— 9. Last pair of legs of male.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XVII.

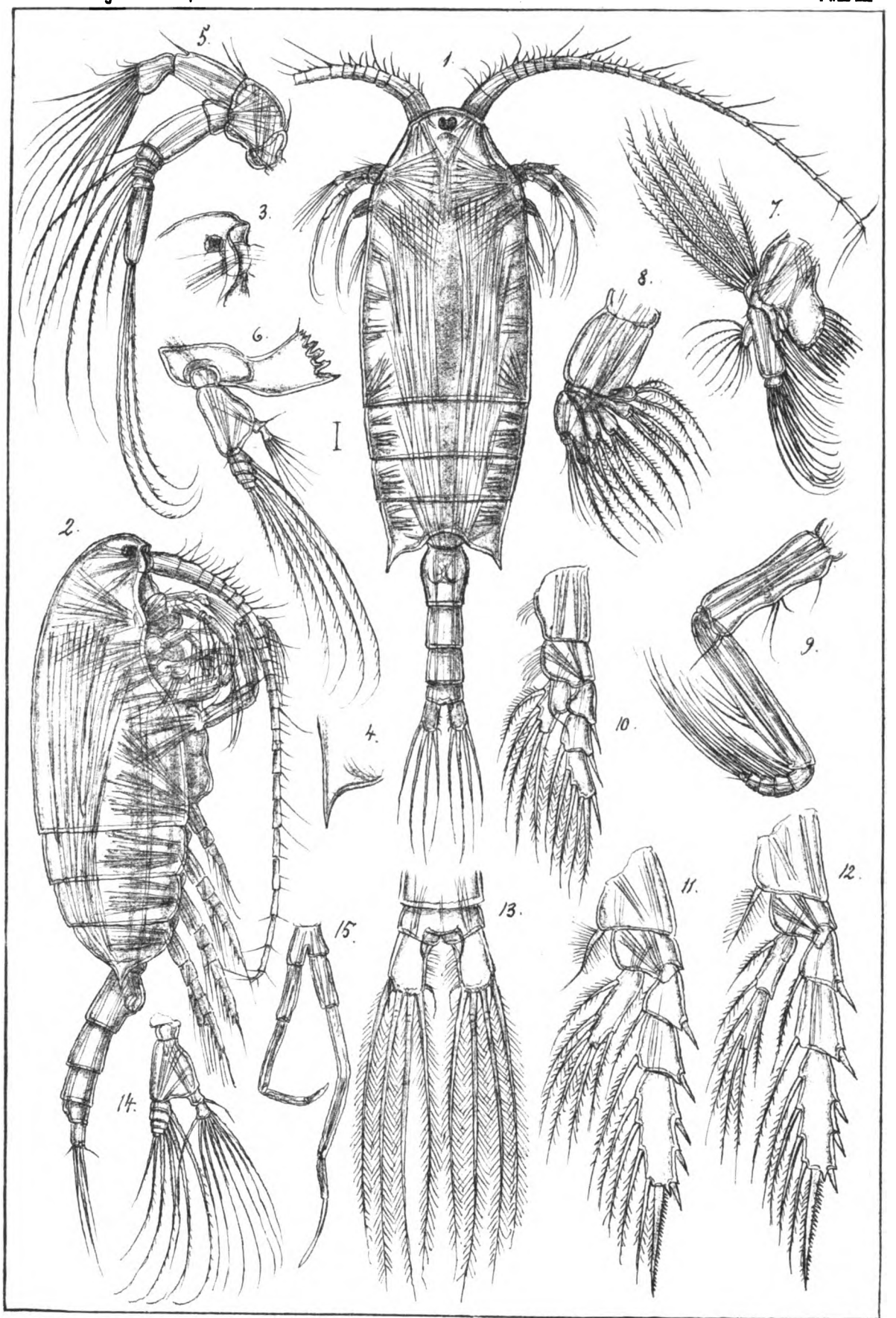
Digitized by Google

PLATE XVII.

Chiridius armatus, (Boeck).

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from right side.
— 3. Frontal part of body, lateral view.
— 4. Spiniform lateral corner of last segment of trunk.
— 5. Posterior antenna.
— 6. Mandible with palp.
— 7. Maxilla.
— 8. Anterior maxilliped.
— 9. Posterior maxilliped.
— 10. Natatory leg of 1st pair.
— 11. Do. of 2nd pair.
— 12. Do. of 4th pair.
— 13. Extremity of tail with the caudal rami, dorsal view.
— 14. Mandibular palp of male.
— 15. Last pair of legs of same.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XVIII.

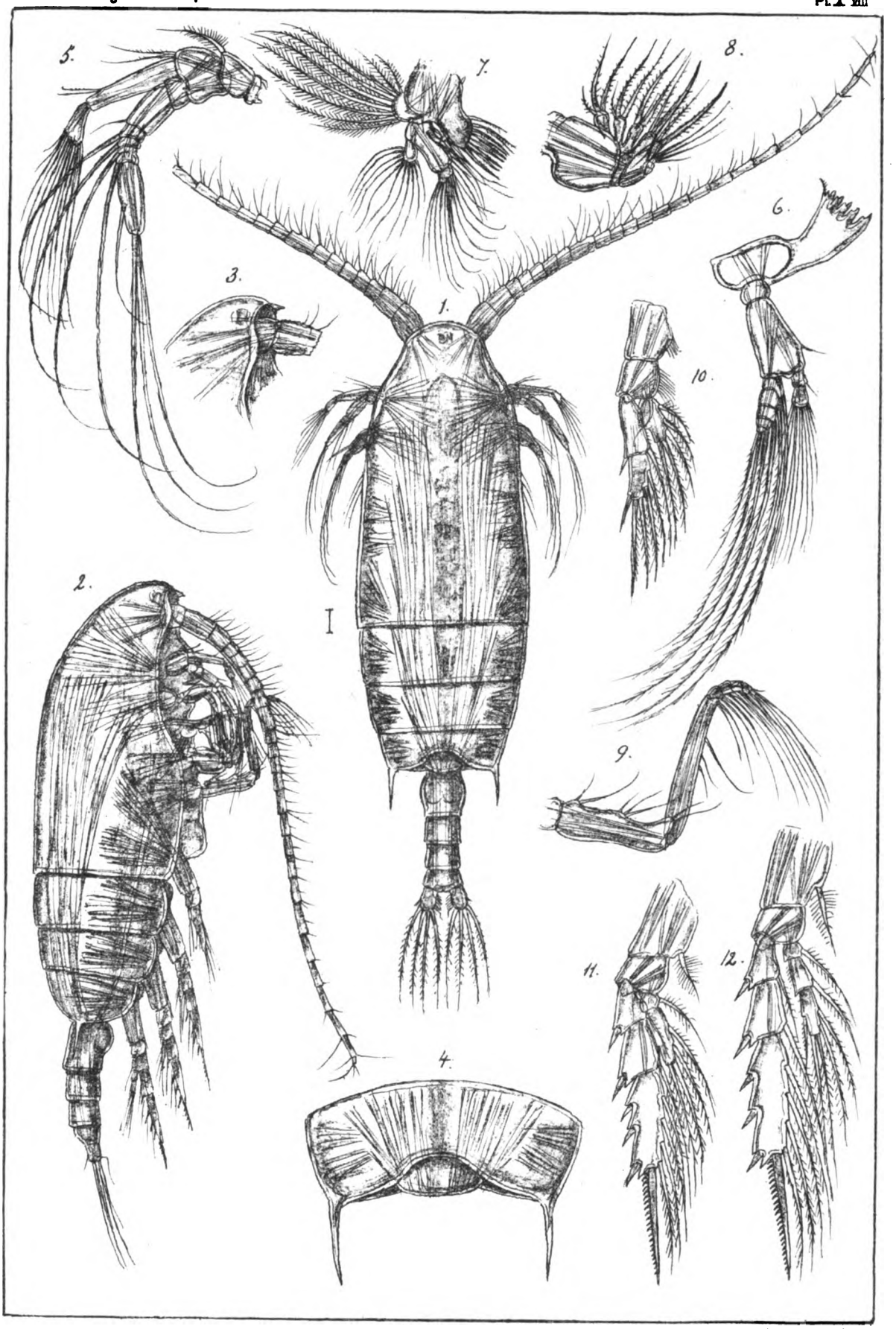
Digitized by Google

PLATE XVIII.

Chiridius tenuispinus, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from right side.
— 3. Frontal part of body, lateral view.
— 4. Last segment of trunk, exhibiting the spiniform processes of the lateral corners, dorsal view.
— 5. Posterior antenna.
— 6. Mandible with palp.
— 7. Maxilla.
— 8. Anterior maxilliped.
— 9. Posterior maxilliped.
— 10. Natatory leg of 1st pair.
— 11. Do. of 2nd pair.
— 12. Do. of 4th pair.

Digitized by Google



Digitized by Google

Digitized by Google

PLATE XIX.

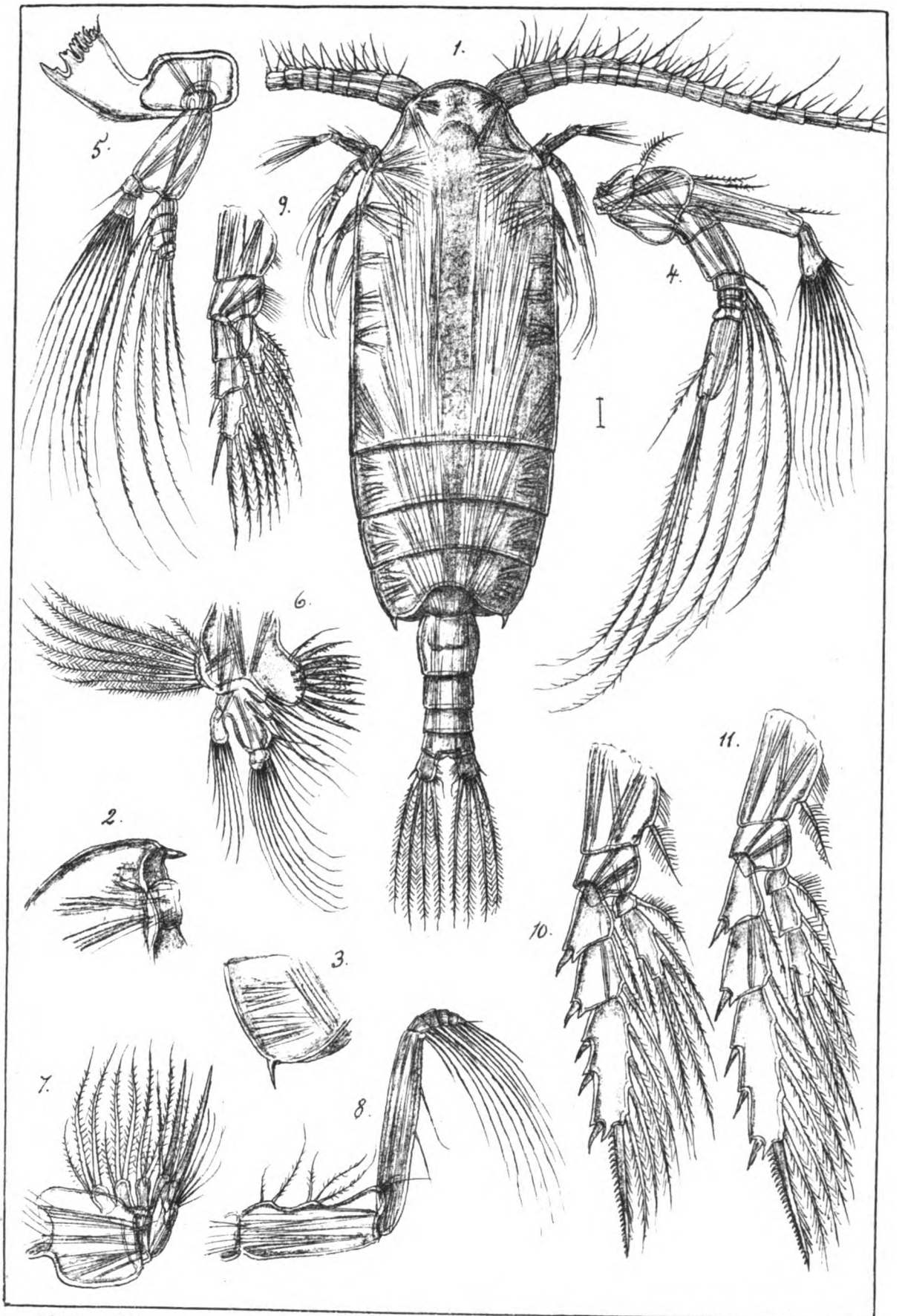
Digitized by Google

PLATE XIX.

Chiridius brevispinus, G. O. Sars.

Fig. 1. Adult female, dorsal view (anterior antenna not fully drawn).
— 2. Frontal part of body, lateral view.
— 3. Lateral part of last segment of trunk, showing the small spiniform process of the outer corner.
— 4. Posterior antenna.
— 5. Mandible with palp.
— 6. Maxilla.
— 7. Anterior maxilliped.
— 8. Posterior maxilliped.
— 9. Natatory leg of 1st pair.
— 10. Do. of 2nd pair.
— 11. Do. of 4th pair.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XX.

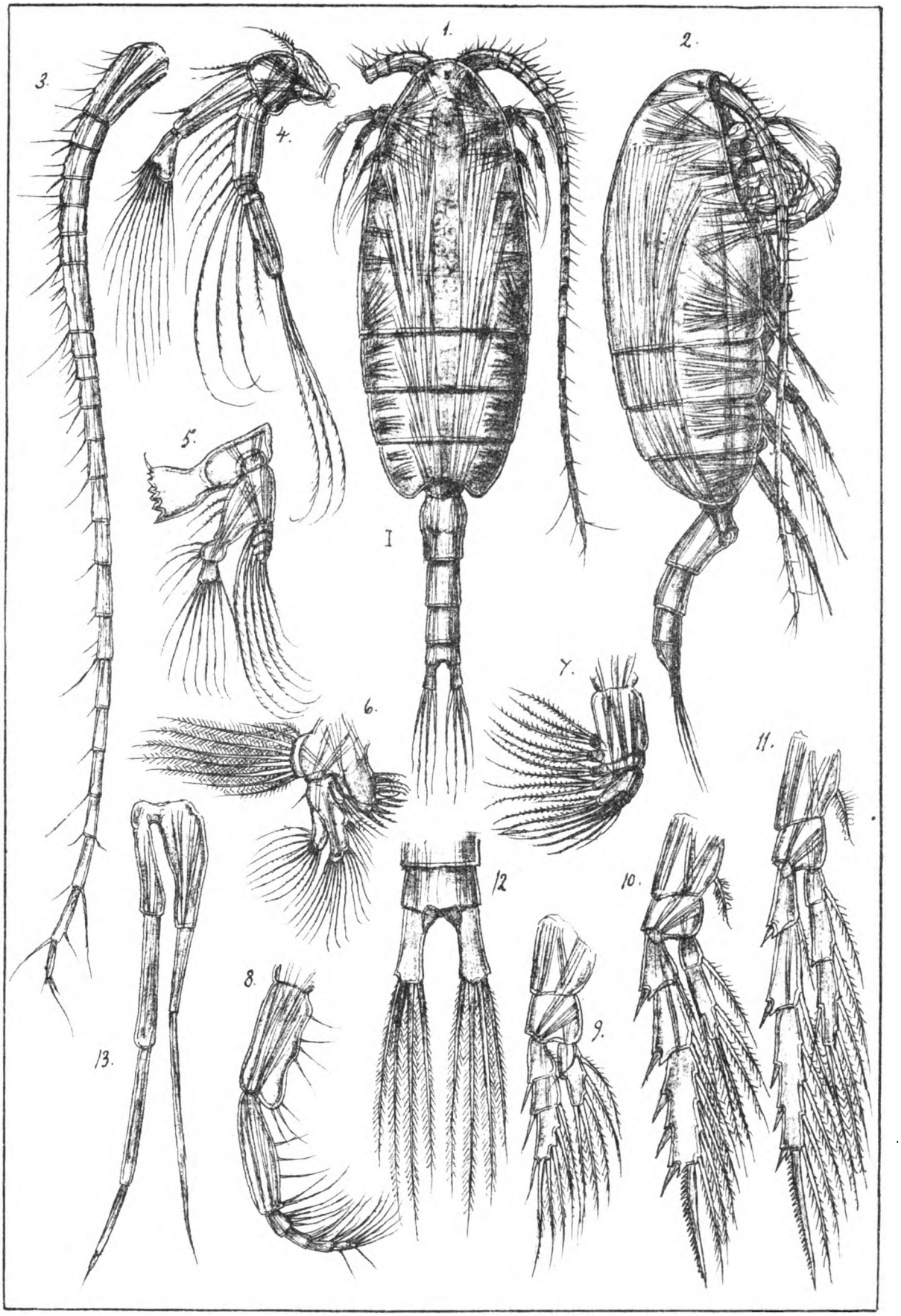
Digitized by Google

PLATE XX.

Pseudocalamus major, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from right side.
— 3. Anterior antenna.
— 4. Posterior antenna.
— 5. Mandible with palp.
— 6. Maxilla.
— 7. Anterior maxilliped.
— 8. Posterior maxilliped.
— 9. Natatory leg of 1st pair.
— 10. Do. of 2nd pair.
— 11. Do. of 4th pair.
— 12. Extremity of tail, with the caudal rami, dorsal view.
— 13. Last pair of legs of male.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXI.

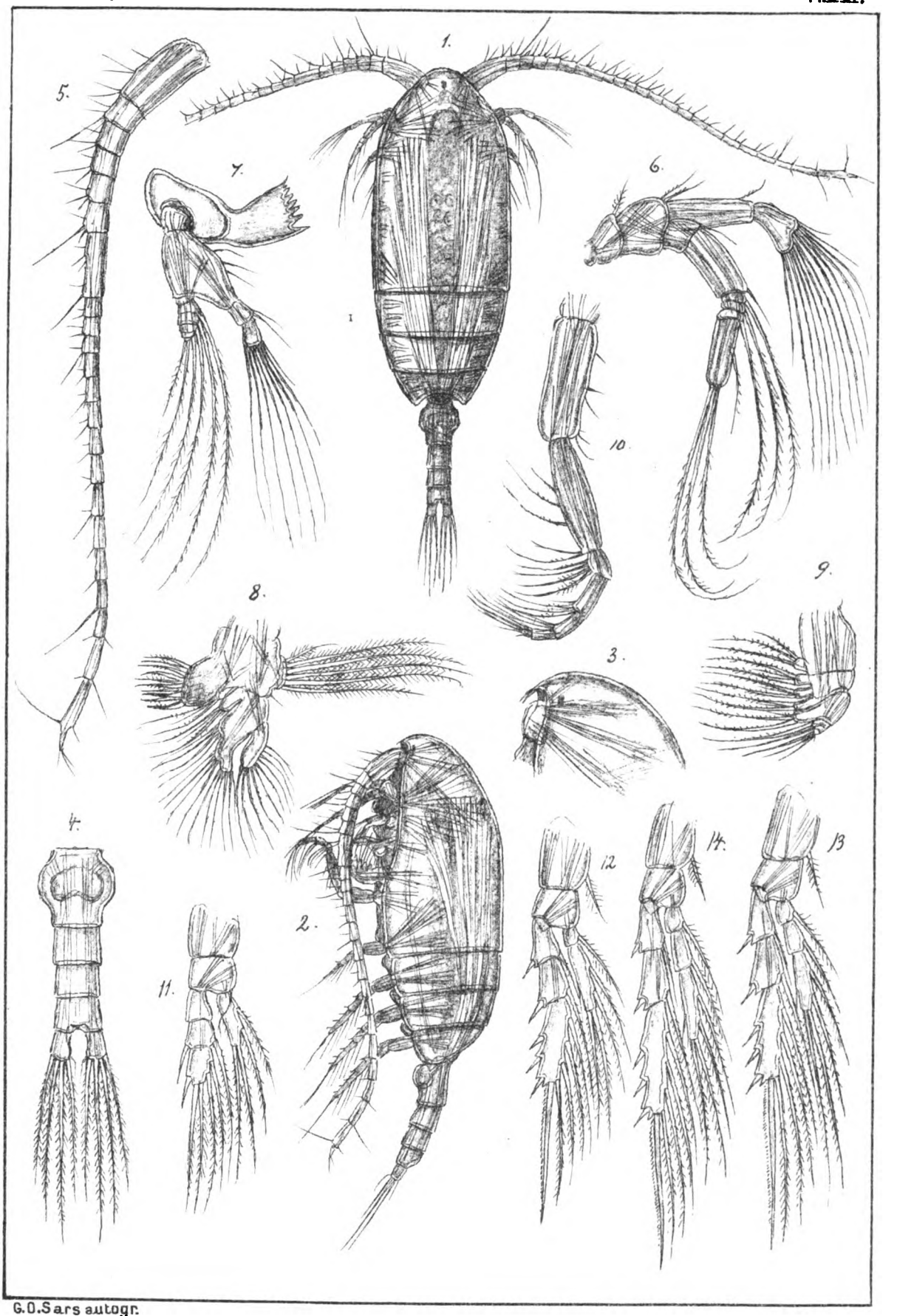
Digitized by Google

PLATE XXI.

Pseudocalanus pygmæus, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from left side.
— 3. Frontal part of body, lateral view.
— 4. Tail, dorsal view.
— 5. Anterior antenna.
— 6. Posterior antenna.
— 7. Mandible with palp.
— 8. Maxilla.
— 9. Anterior maxilliped.
— 10. Posterior maxilliped.
— 11. Natatory leg of 1st pair.
— 12. Do. of 2nd pair.
— 13. Do. of 3rd pair.
— 14. Do. of 4th pair.

Digitized by Google



G.O. Sars autogr.

trykt i den priv Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXII.

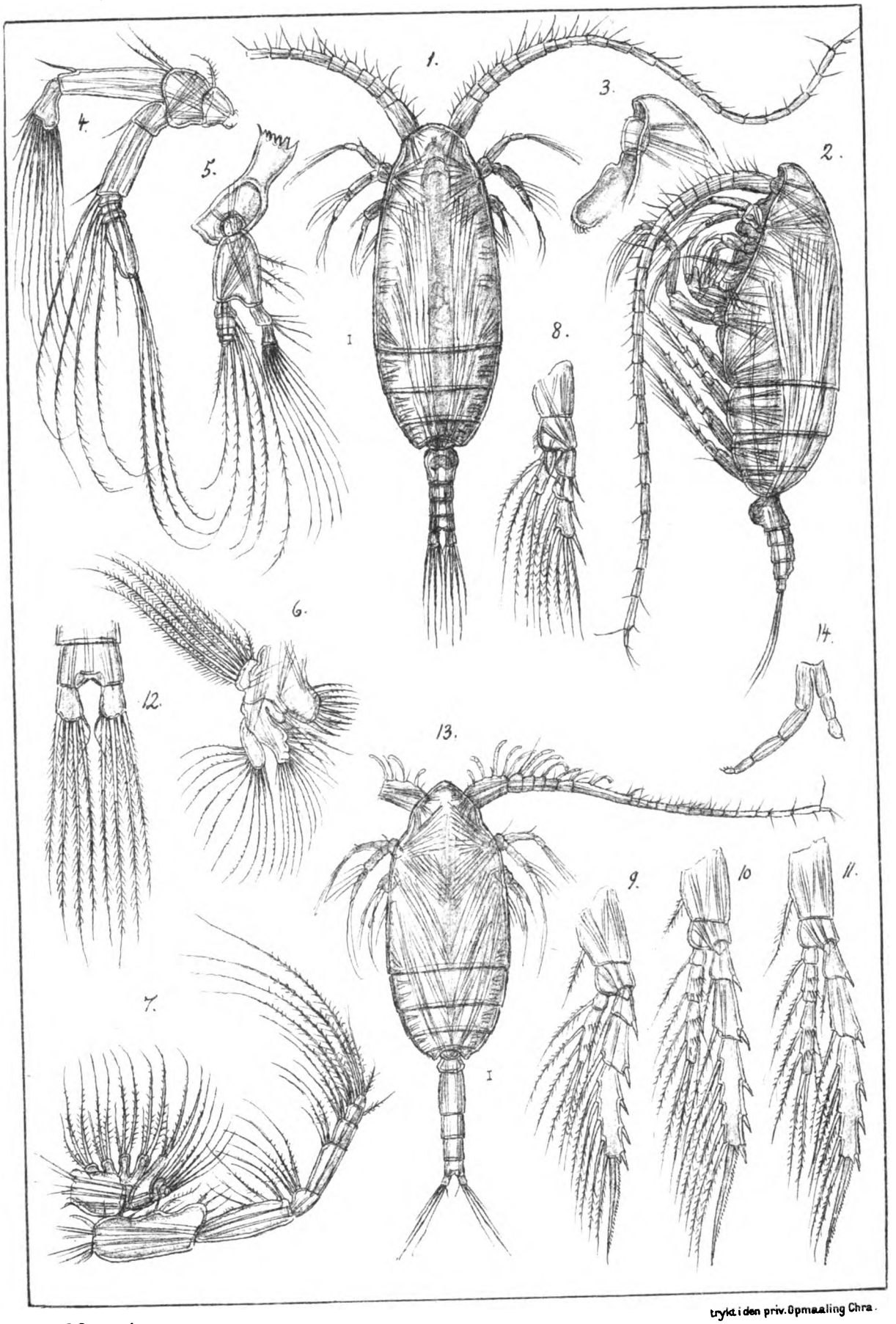
Digitized by Google

PLATE XXII.

Spinocalanus longicornis, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from left side.
— 3. Frontal part of body, with the anterior lip, lateral view.
— 4. Posterior antenna.
— 5. Mandible with palp.
— 6. Maxilla.
— 7. Anterior and posterior maxillipeds.
— 8. Natatory leg of 1st pair.
— 9. Do. of 2nd pair.
— 10. Do. of 3rd pair.
— 11. Do. of 4th pair.
— 12. Extremity of tail, with the caudal rami, dorsal view.
— 13. Adult male, dorsal view (left anterior antenna not fully drawn).
— 14. Last pair of legs of same.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXIII.

Digitized by Google

PLATE XXIII.

Heterochæta norvegica, Boeck.

Fig. 1. Adult female, with adhering spermatophore, dorsal view (right anterior antenna not fully drawn).

— 2. Same, viewed from right side.

— 3. Frontal part of body, lateral view.

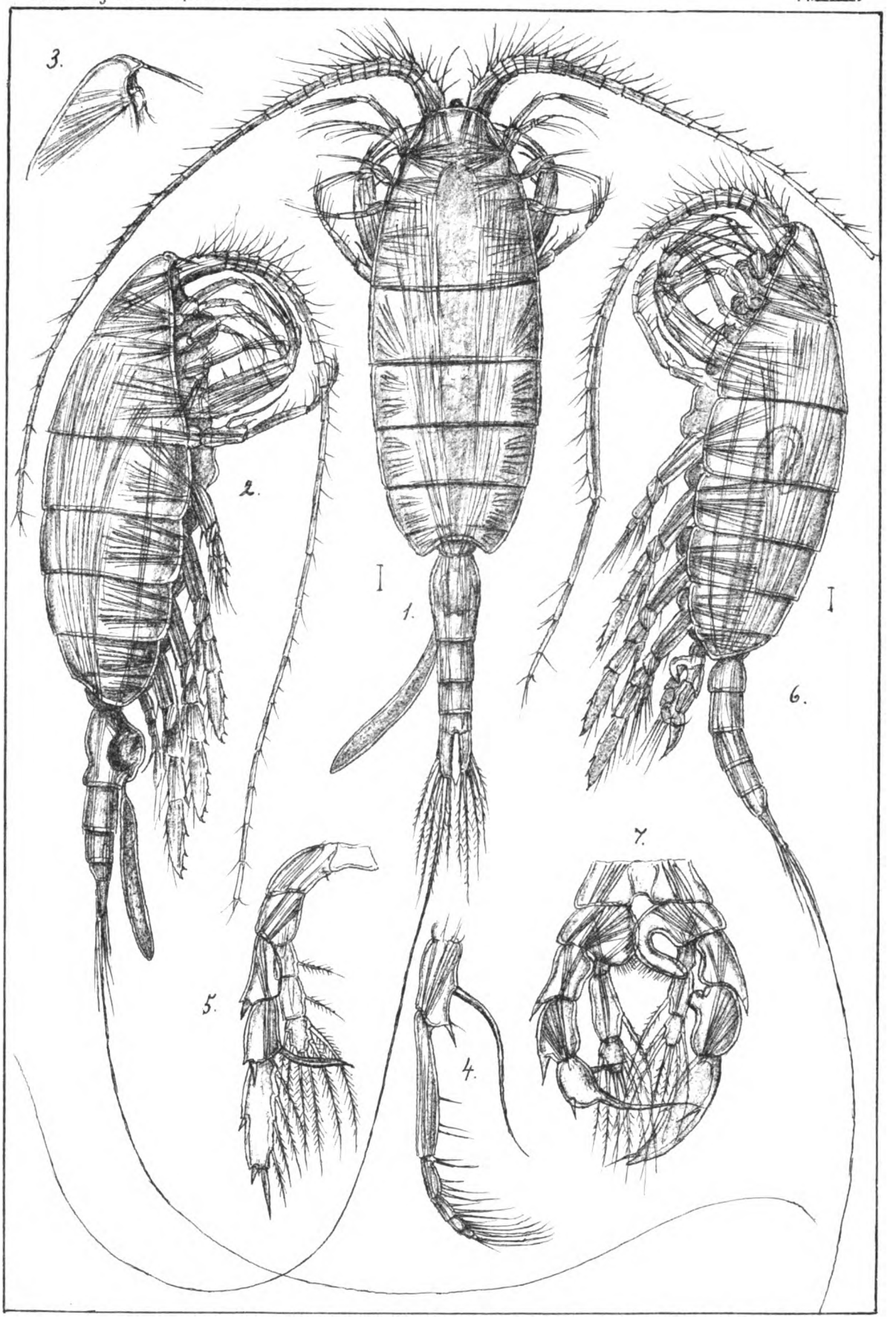
— 4. Posterior maxilliped.

— 5. Leg of last pair of female.

— 6. Adult male, viewed from left side.

— 7. Last pair of legs of same.

Digitized by Google



G.O.Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXIV.

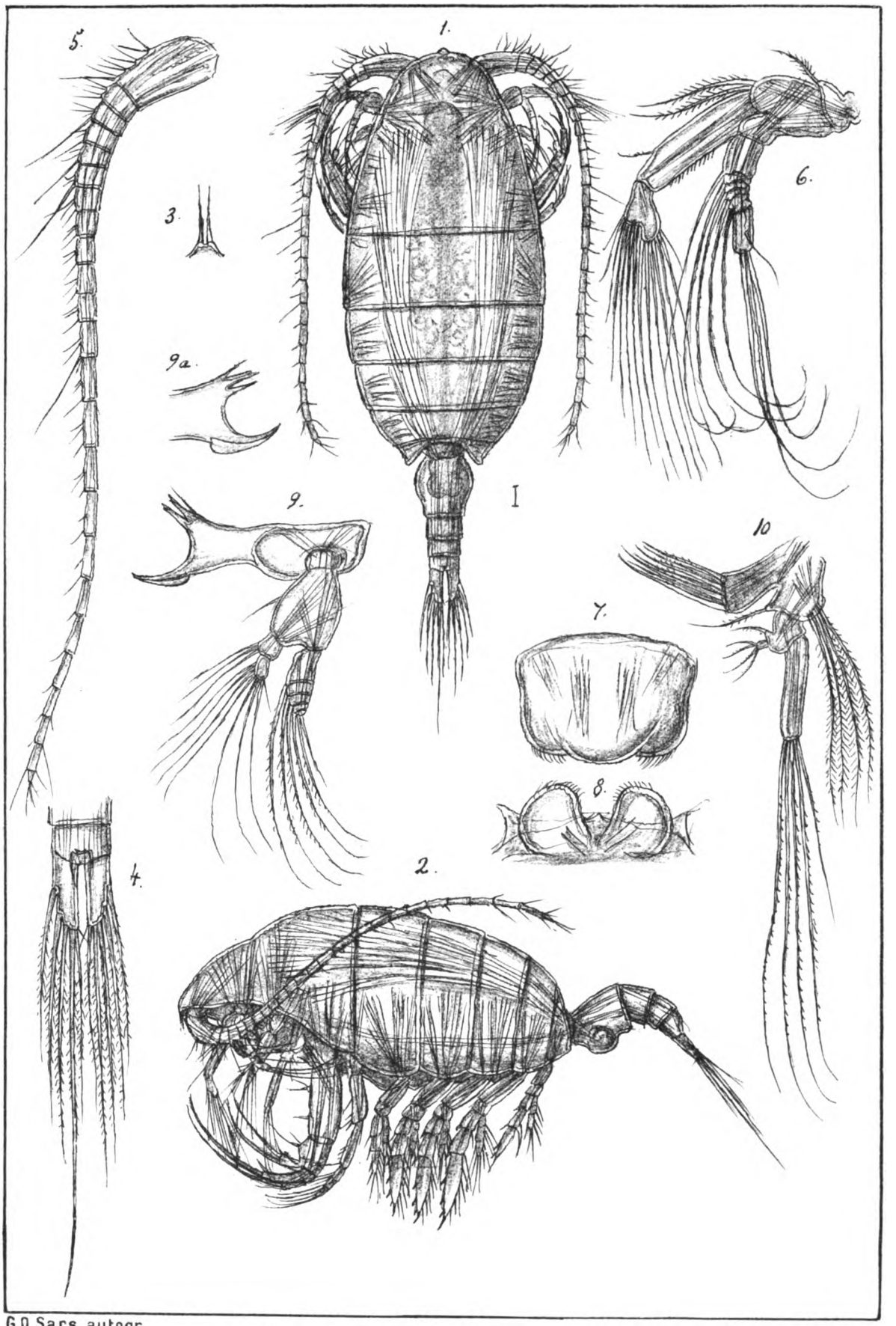
Digitized by Google

PLATE XXIV.

Heterochæta compacta, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from left side.
— 3. Rostral prominence, with the tentacular filaments, front view.
— 4. Extremity of tail, with the caudal rami, dorsal view.
— 5. Anterior antenna.
— 6. Posterior antenna.
— 7. Anterior lip.
— 8. Posterior lip.
— 9. Right mandible with palp.
— 9a. Masticatory part of left mandible.
— 10. Maxilla.

Digitized by Google



G.O.Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXV.

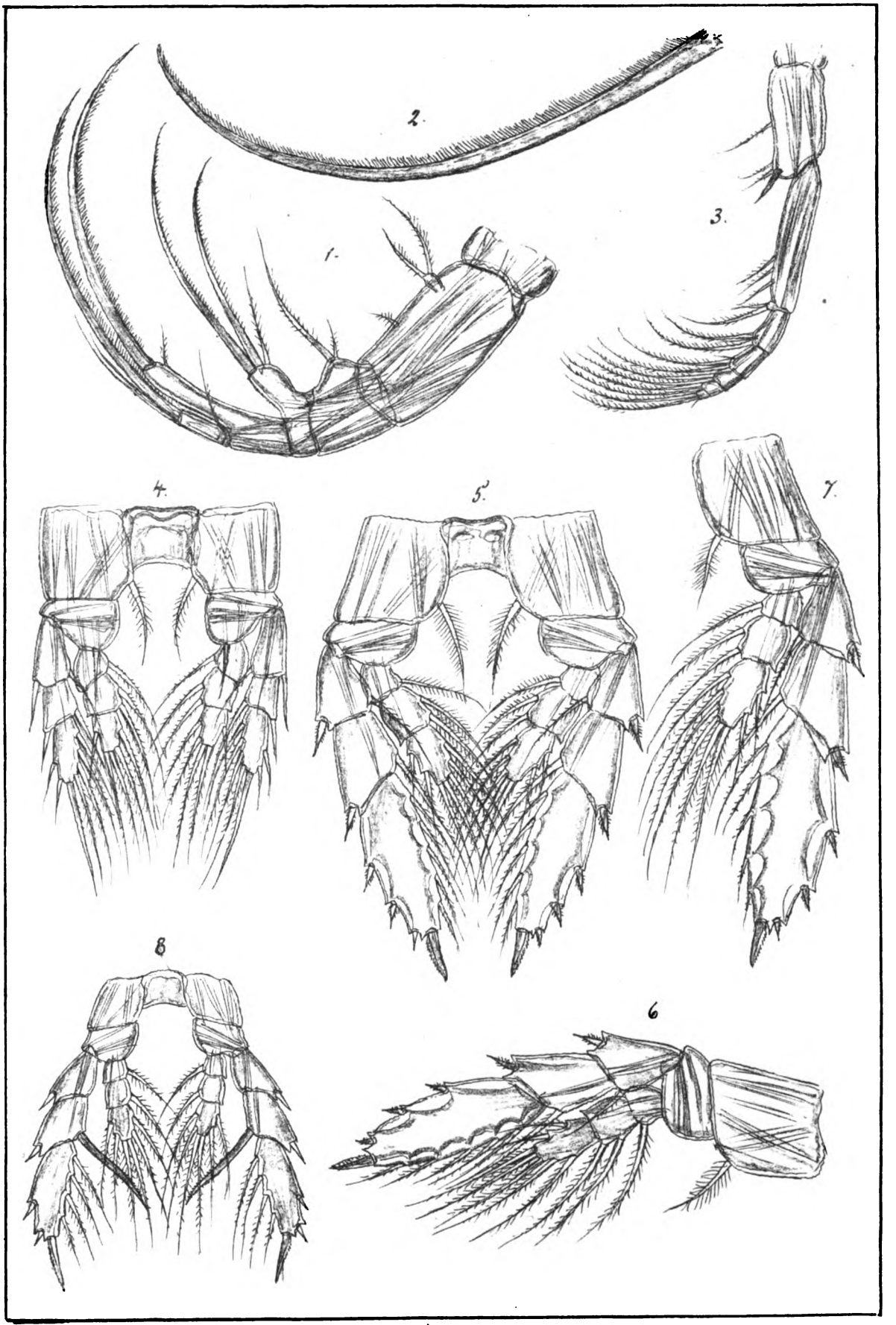
Digitized by Google

PLATE XXV.

Heterochæta compacta, G. O. Sars,
(continued).

Fig. 1. Anterior maxilliped.
— 2. One of the terminal claws of same, more highly magnified.
— 3. Posterior maxilliped.
— 4. First pair of legs.
— 5. Second pair of legs.
— 6. Leg of 3rd pair.
— 7. Leg of 4th pair.
— 8. Last pair of legs.

Digitized by Google



G.O. Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXVI.

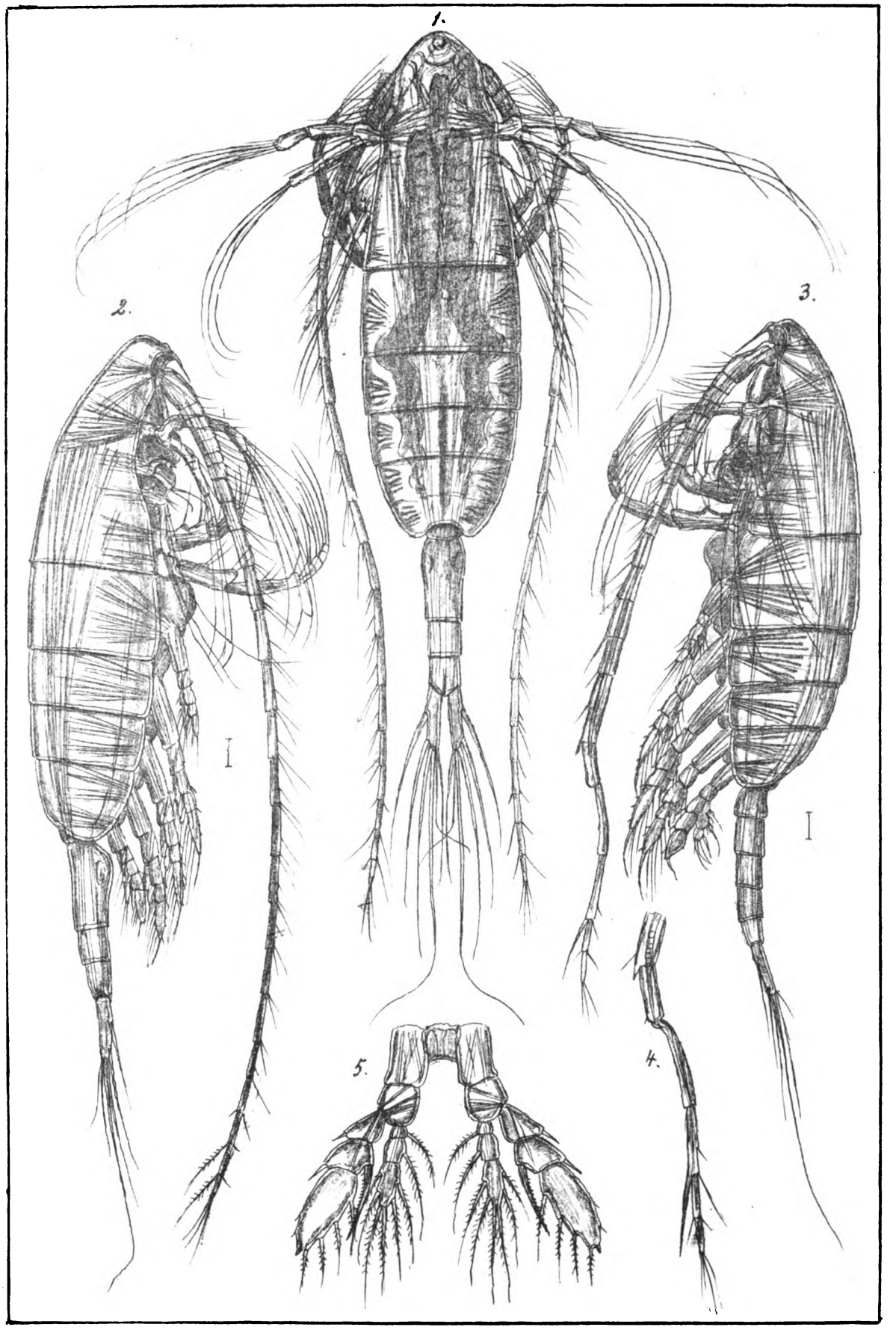
Digitized by Google

PLATE XXVI.

Augaptilus glacialis, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from right side.
— 3. Adult male, viewed from left side.
— 4. Same, terminal part of left anterior antenna.
— 5. Last pair of legs of female.

Digitized by Google



G.O. Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXVII.

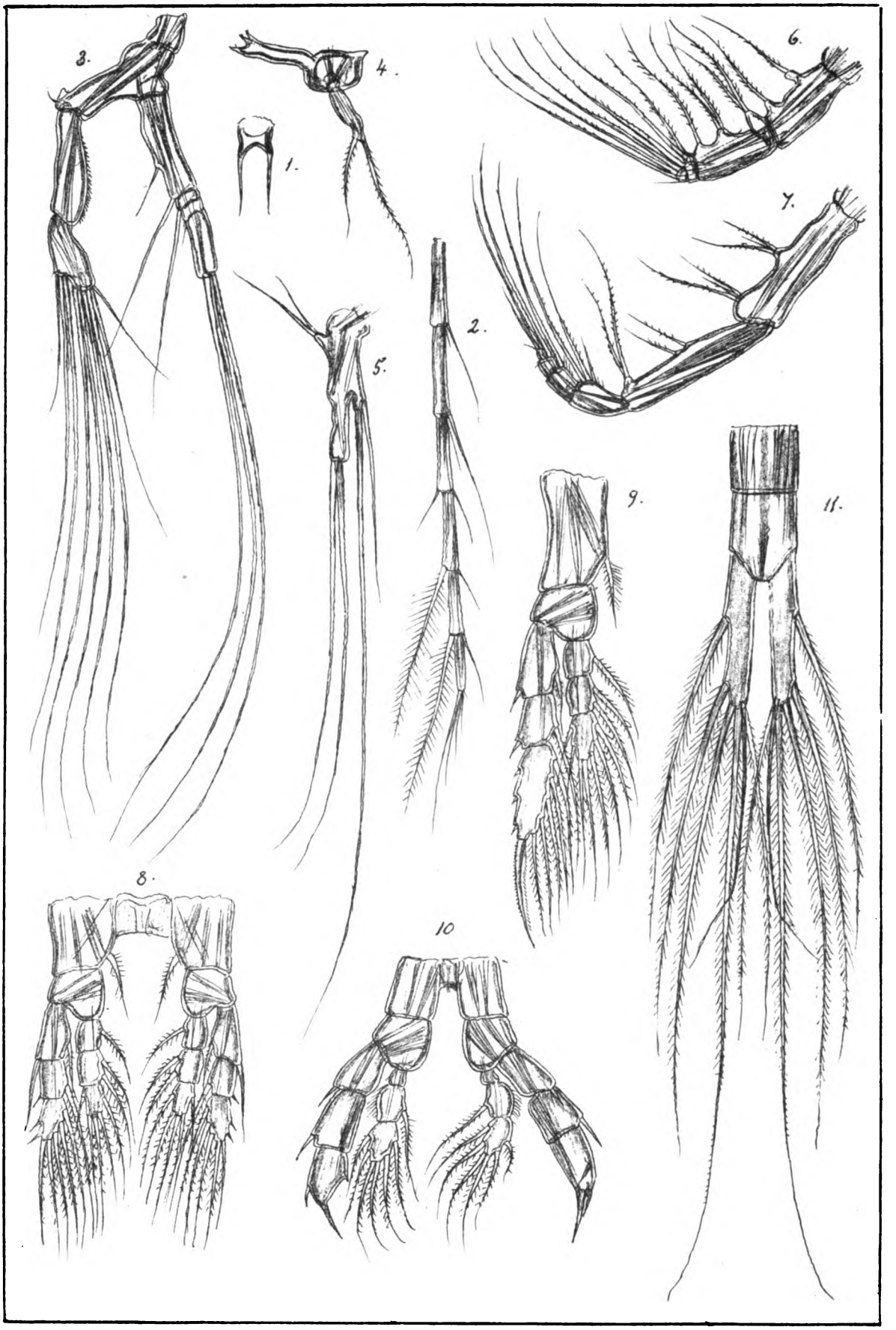
Digitized by Google

PLATE XXVII.

Augaptilus glacialis, G. O. Sars,
(continued.)

Fig. 1. Rostral prominence, with the tentacular filaments, front view.
— 2. Distal part of anterior antenna.
— 3. Posterior antenna.
— 4. Mandible with palp.
— 5. Maxilla.
— 6. Anterior maxilliped.
— 7. Posterior maxilliped.
— 8. First pair of legs.
— 9. Leg of 2nd pair.
— 10. Last pair of legs of male.
— 11. Extremity of tail, with the caudal rami, dorsal view.

Digitized by Google



G.O. Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXVIII.

Digitized by Google

PLATE XXVIII.

Hemicalanus spinifrons, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).

— 2. Spiniform frontal process.

— 3. Posterior antenna.

— 3 (bis). Mandible with palp.

— 4. Body of left mandible, viewed from inner face.

— 5. Masticatory part of right mandible.

— 6. Maxilla.

— 7. Anterior maxilliped.

— 8. Posterior maxilliped.

— 9. Leg of 1st pair.

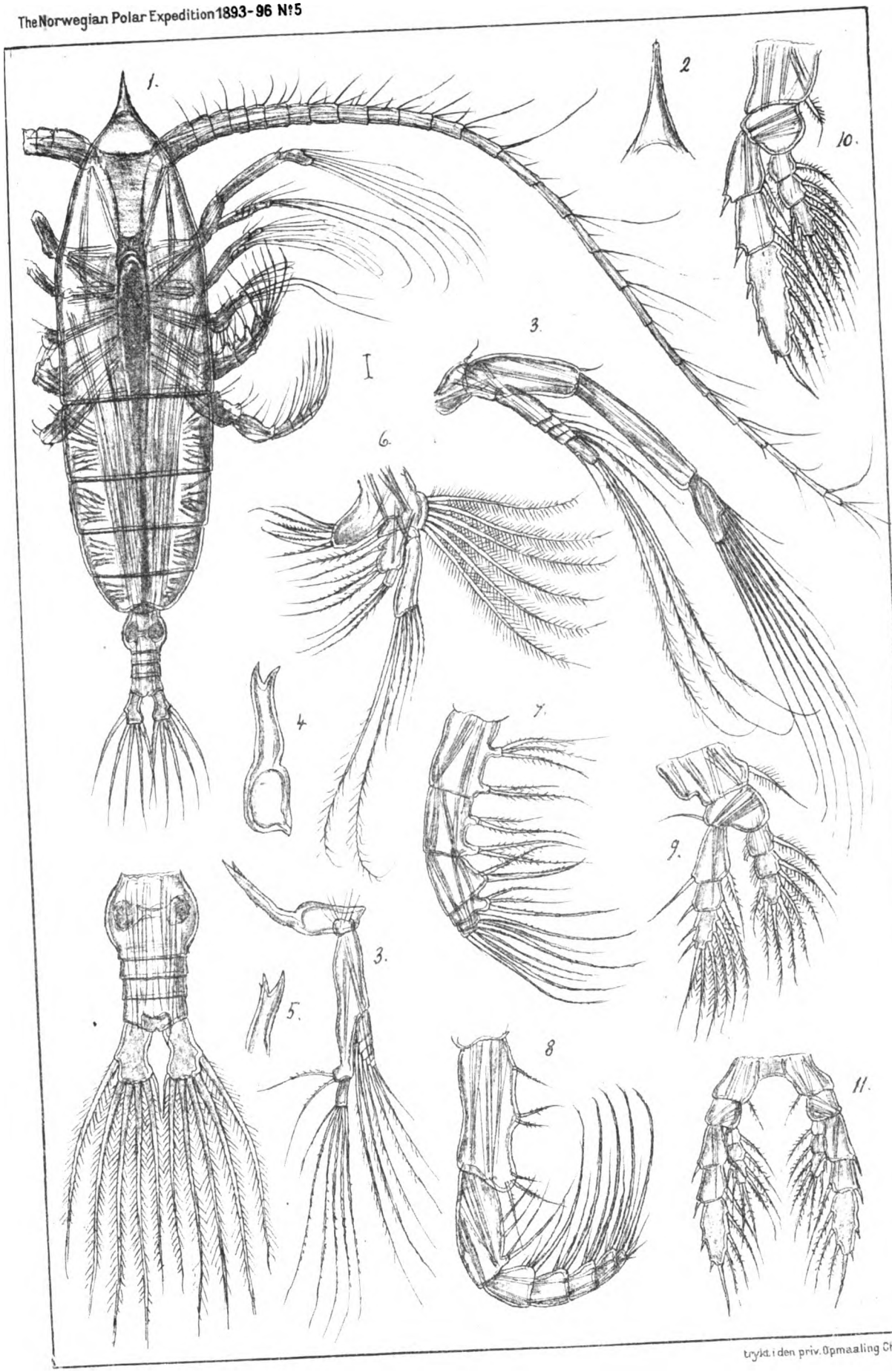
— 10. Leg of 2nd pair.

— 11. Last pair of legs.

— 12 (not numbered in the plate). Tail, dorsal view.

Digitized by Google

The Norwegian Polar Expedition 1893-96 N:o 5



trykt i den priv. Opmaaling Chra.

G.O. Sars autogr.

Digitized by Google

Digitized by Google

PLATE XXIX.

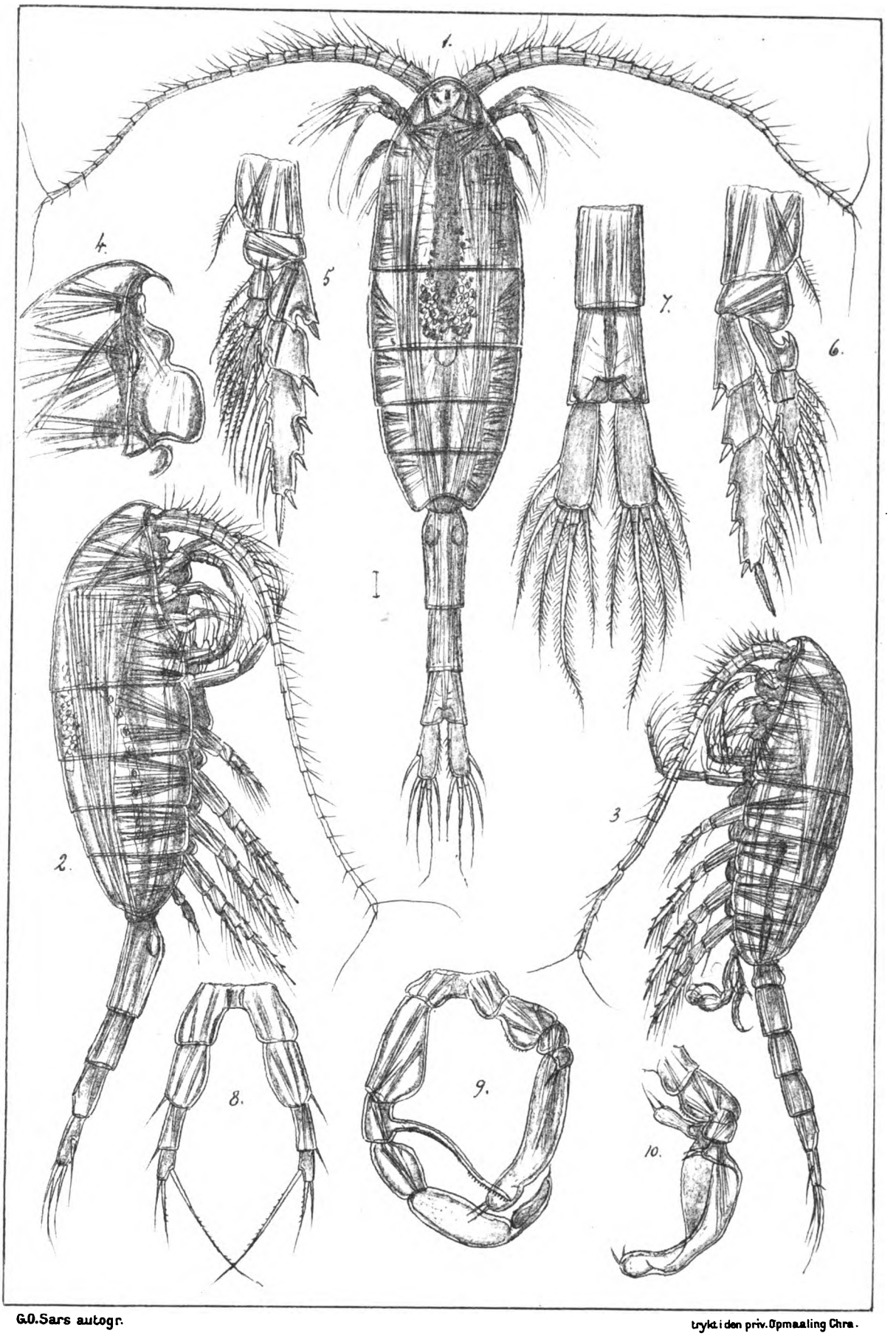
Digitized by Google

PLATE XXIX.

Metridia longa, (Lubbock).

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from right side.
— 3. Adult male, viewed from left side.
— 4. Frontal part of body, with anterior and posterior lips, lateral view.
— 5. Natatory leg of 3rd pair of male.
— 6. — of 2nd pair of female.
— 7. Extremity of tail with the caudal rami, dorsal view.
— 8. Last pair of legs of female.
— 9. Last pair of legs of male.
— 10. Right leg of same pair, isolated.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXX.

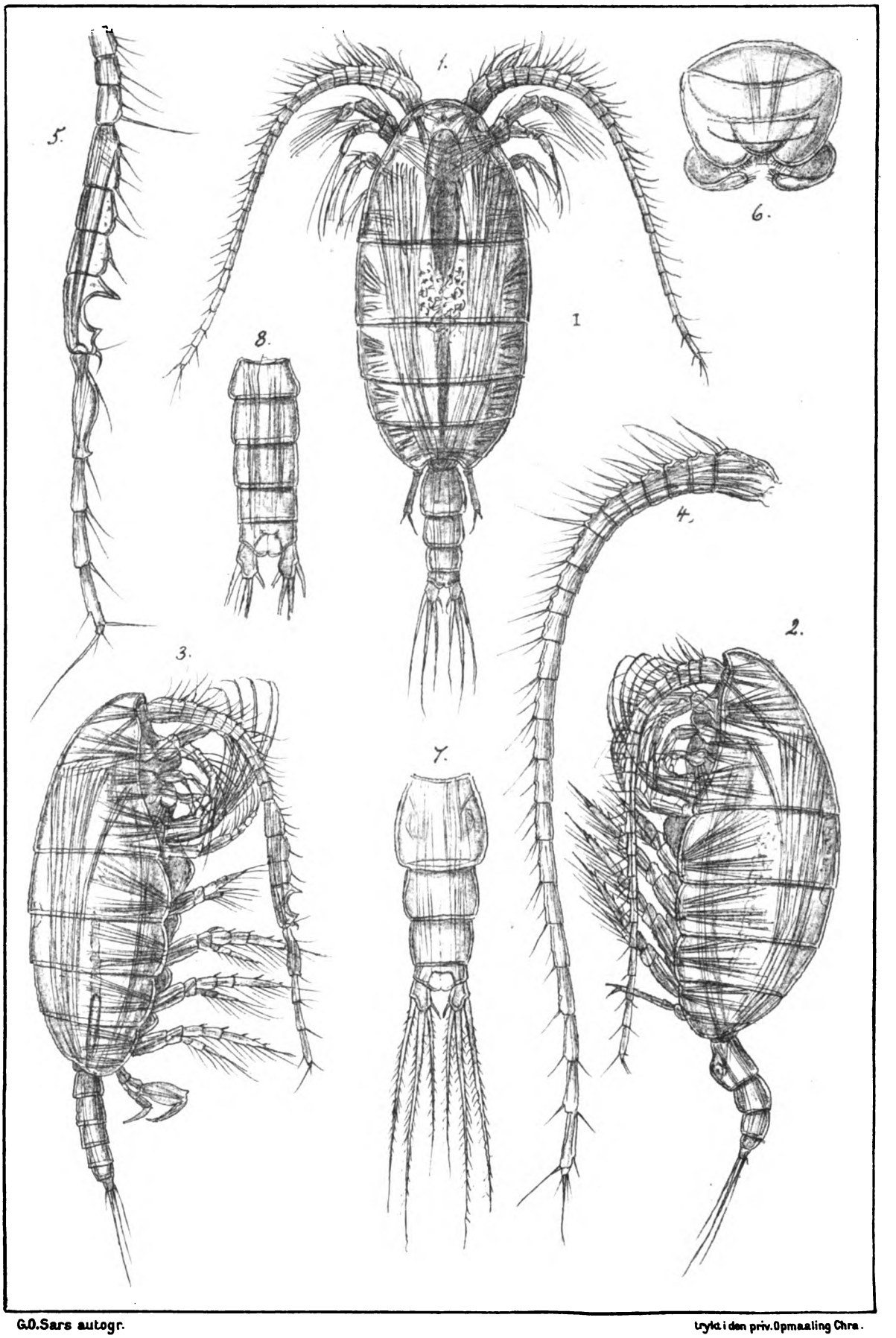
Digitized by Google

PLATE XXX.

Temorites brevis, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from left side.
— 3. Adult male, viewed from right side.
— 4. Anterior antenna of female.
— 5. Right anterior antenna of male (the proximal part not drawn).
— 6. Anterior and posterior lips, ventral view.
— 7. Tail of female, dorsal view.
— 8. Tail of male (caudal setæ not fully drawn).

Digitized by Google



G.O.Sars autogr. Trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXXI.

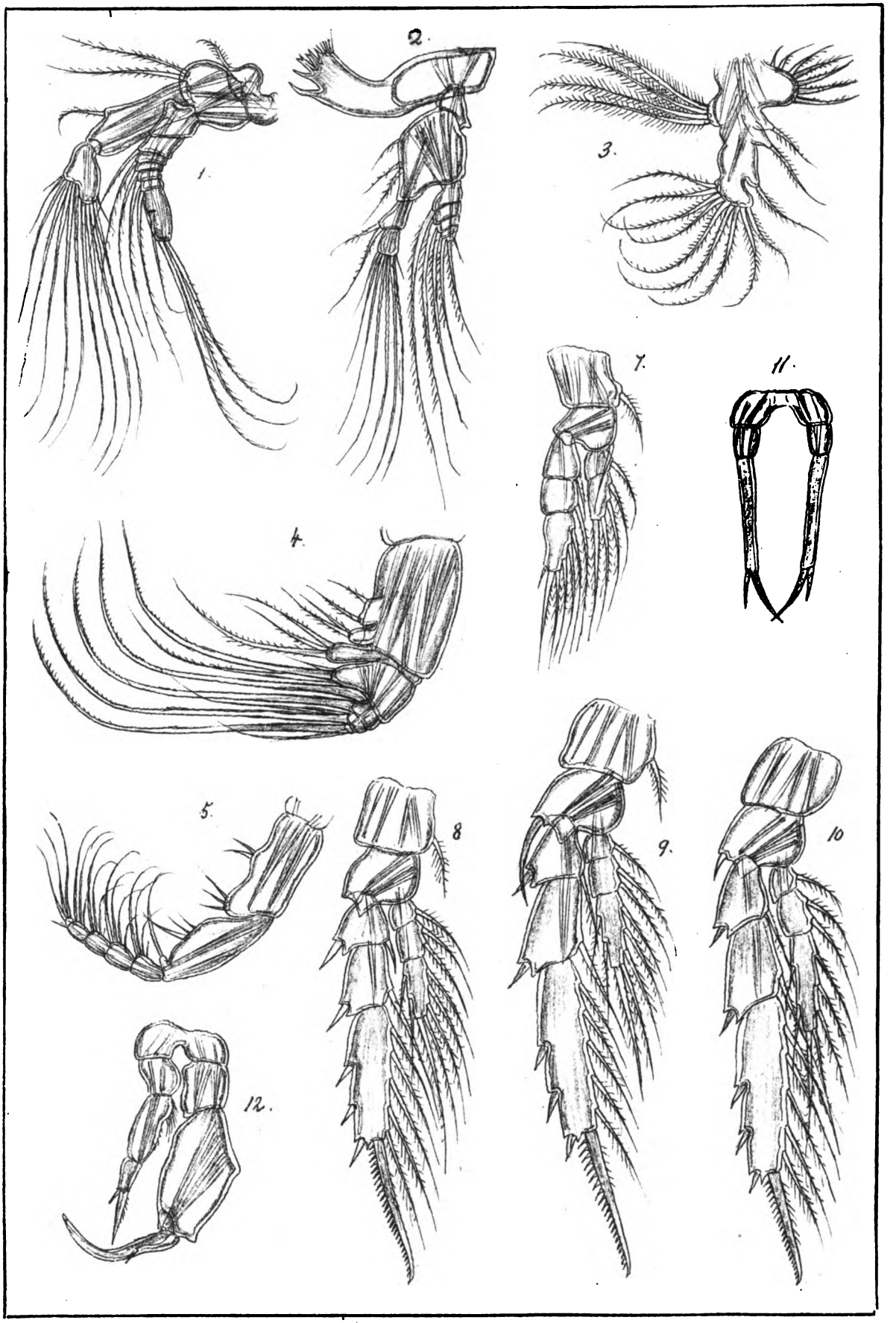
Digitized by Google

PLATE XXXI.

Temorites brevis, G. O. Sars,
(continued).

Fig. 1. Posterior antenna.
— 2. Mandible with palp.
— 3. Maxilla.
— 4. Anterior maxilliped.
— 5. Posterior maxilliped.
— 6. Natatory leg of 1st pair.
— 7. Do. of 2nd pair.
— 8. Do. of 3rd pair.
— 9. Do. of 4th pair.
— 10. Last pair of legs of female.
— 11. Last pair of legs of male.

Digitized by Google



Digitized by Google

Digitized by Google

PLATE XXXII.

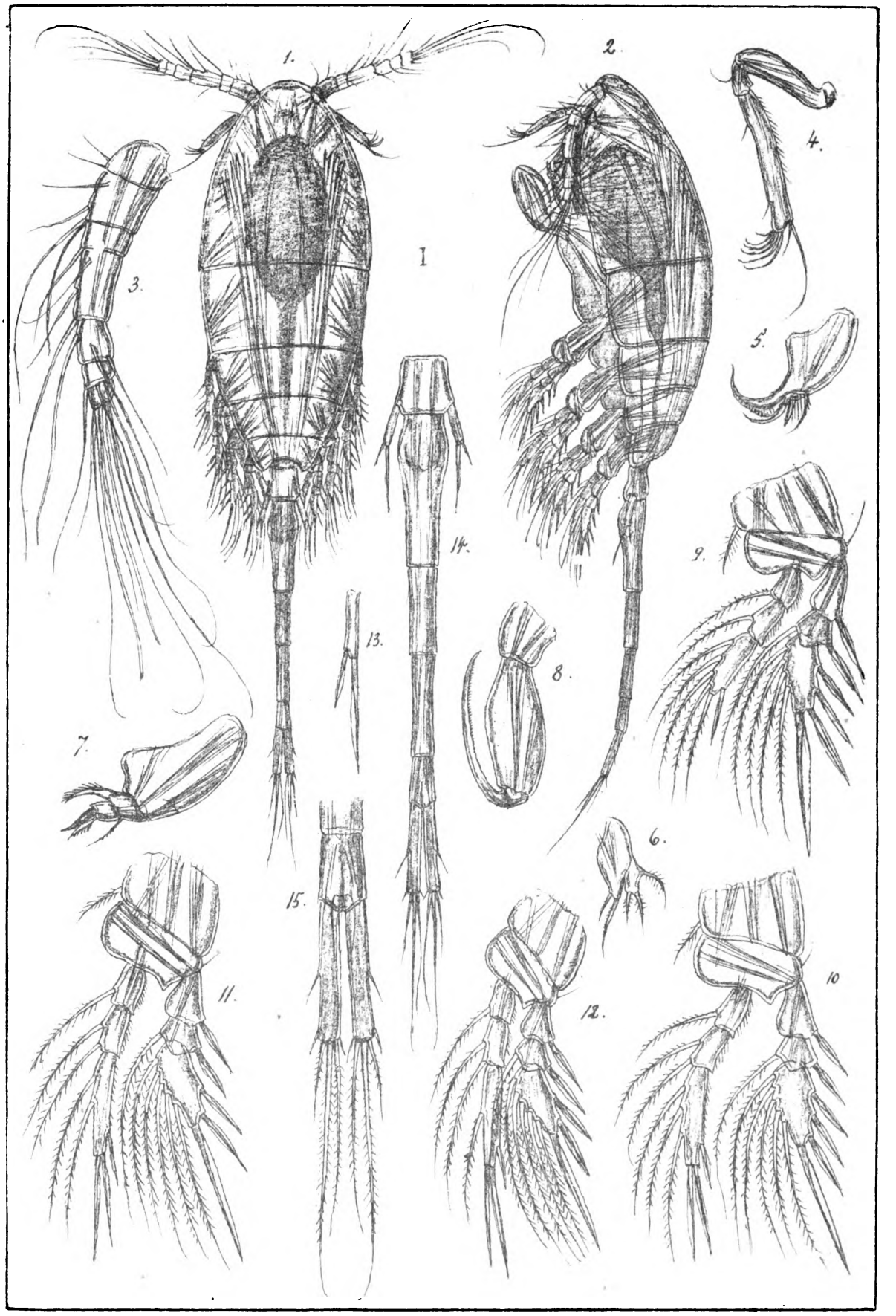
Digitized by Google

PLATE XXXIII.

Lubbockia glacialis, G. O. Sars.

Fig. 1. Adult female, dorsal view.
— 2. Same, viewed from left side.
— 3. Anterior antenna.
— 4. Posterior antenna.
— 5. Mandible.
— 6. Maxilla.
— 7. Anterior maxilliped.
— 8. Posterior maxilliped.
— 9. Natatory leg of 1st pair.
— 10. Do. of 2nd pair.
— 11. Do. of 3rd pair.
— 12. Do. of 4th pair.
— 13. Leg of last pair.
— 14. Tail, together with last segment of trunk, dorsal view.

Digitized by Google



G.O. Sars autogr.

trykt i den priv. Opmaaling Chra

Digitized by Google

Digitized by Google

PLATE XXXIV.

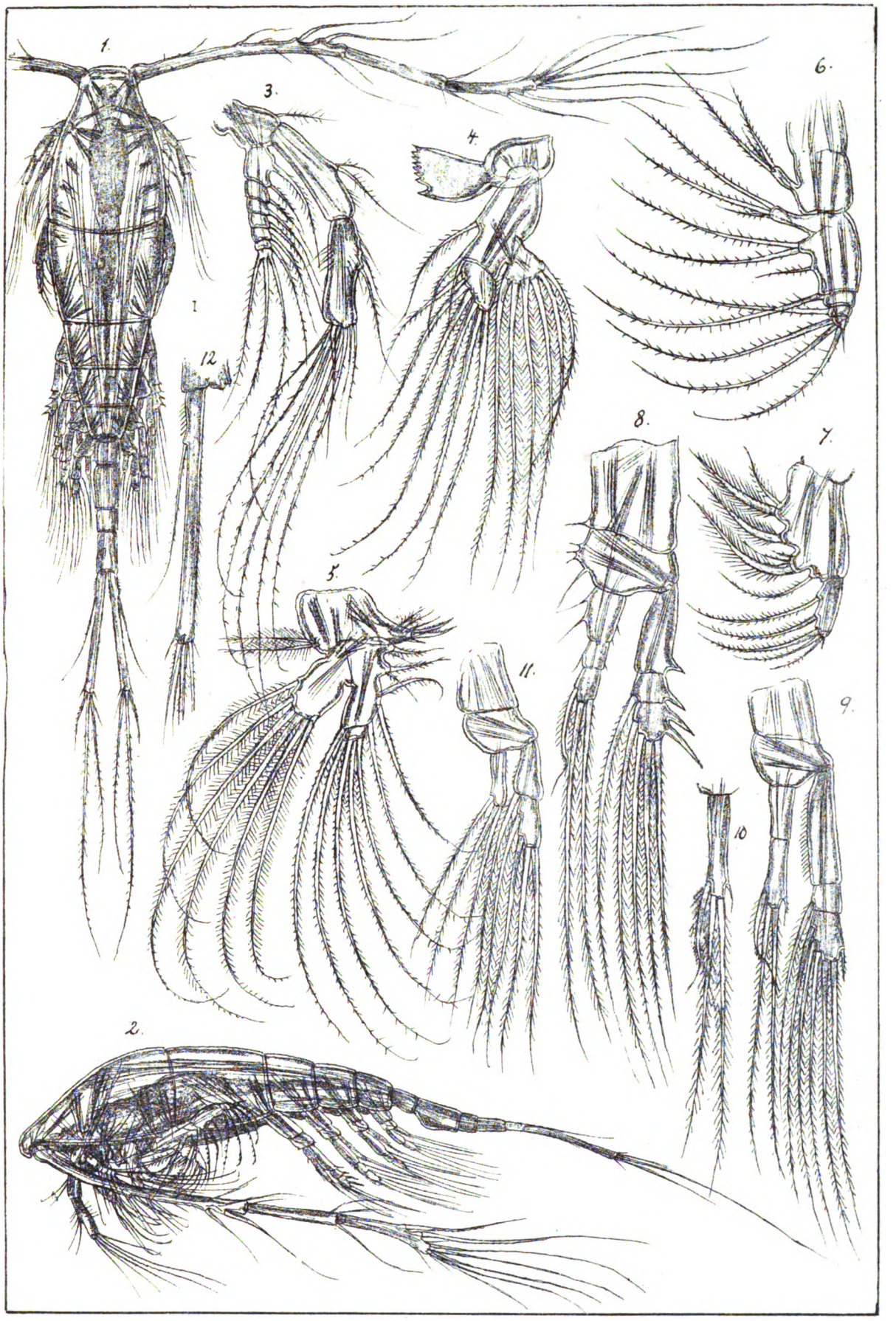
Digitized by Google

PLATE XXXIV.

Mormonilla polaris, G. O. Sars.

Fig. 1. Adult female, dorsal view (left anterior antenna not fully drawn).
— 2. Same, viewed from left side.
— 3. Posterior antenna.
— 4. Mandible with palp.
— 5. Maxilla.
— 6. Anterior maxilliped.
— 7. Posterior maxilliped.
— 8. Natatory leg of 1st pair.
— 9. Do. of 2nd pair.
— 10. Inner ramus of a leg of 3rd pair.
— 11. Natatory leg of 4th pair.
— 12. Caudal ramus.

Digitized by Google



G.O. Sars autogr. trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXXV.

Digitized by Google

PLATE XXXV.

Conchœcia maxima, Brady & Norman.

Fig. 1. Adult female, viewed from left side (left valve removed).

— 2. Shell of female, viewed from below.

— 3. Adult male, viewed from right side (right valve removed).

— 4. Antennula of female together with the frontal tentacle, lateral view.

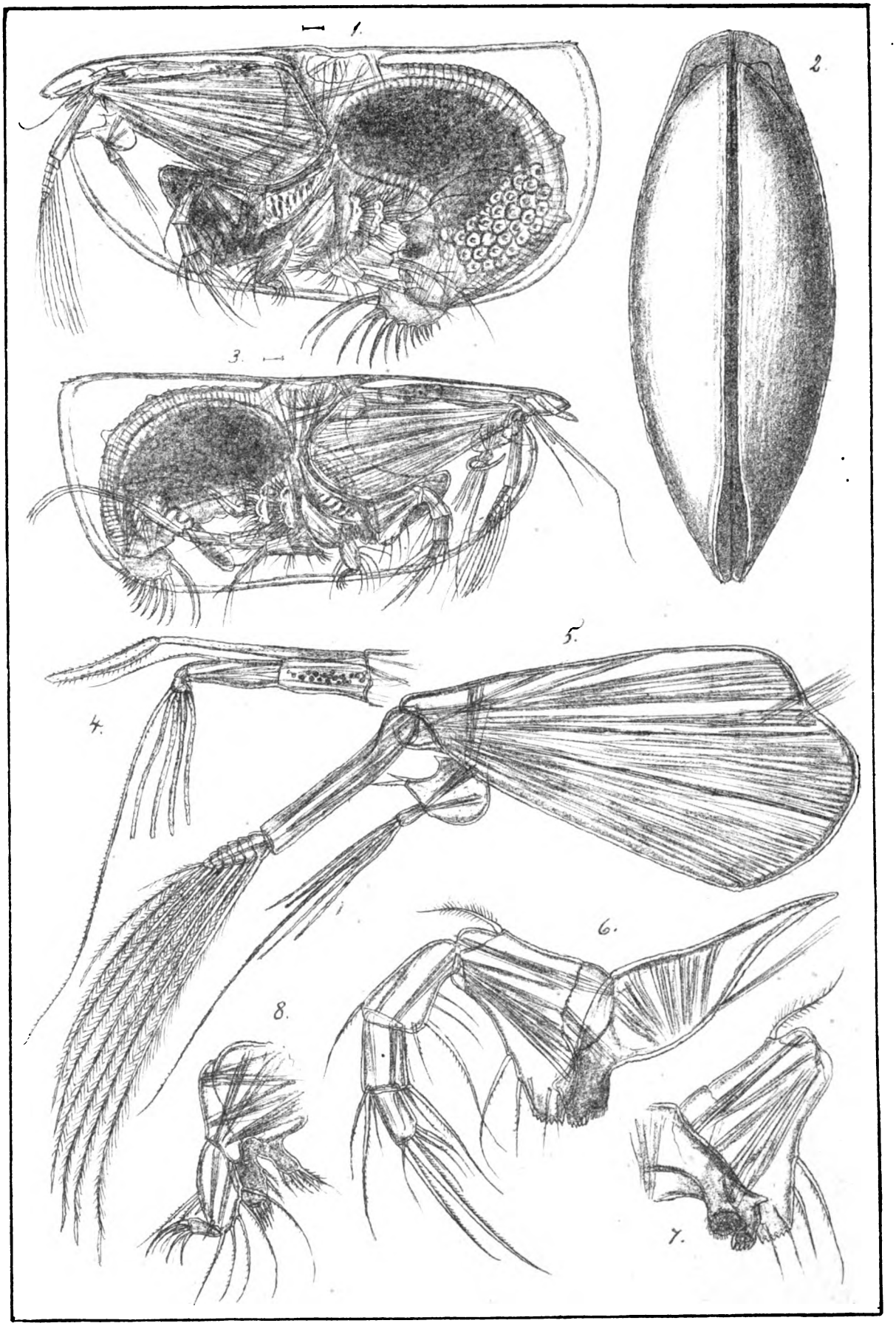
— 5. Antenna of female.

— 6. Mandible with palp.

— 7. Same, masticatory part and basal joint of palp, viewed from the inner face.

— 8. Maxilla.

Digitized by Google



G.O. Sars autogr. Trykt i den priv. Opmaaling Chra.

Digitized by Google

Digitized by Google

PLATE XXXVI.

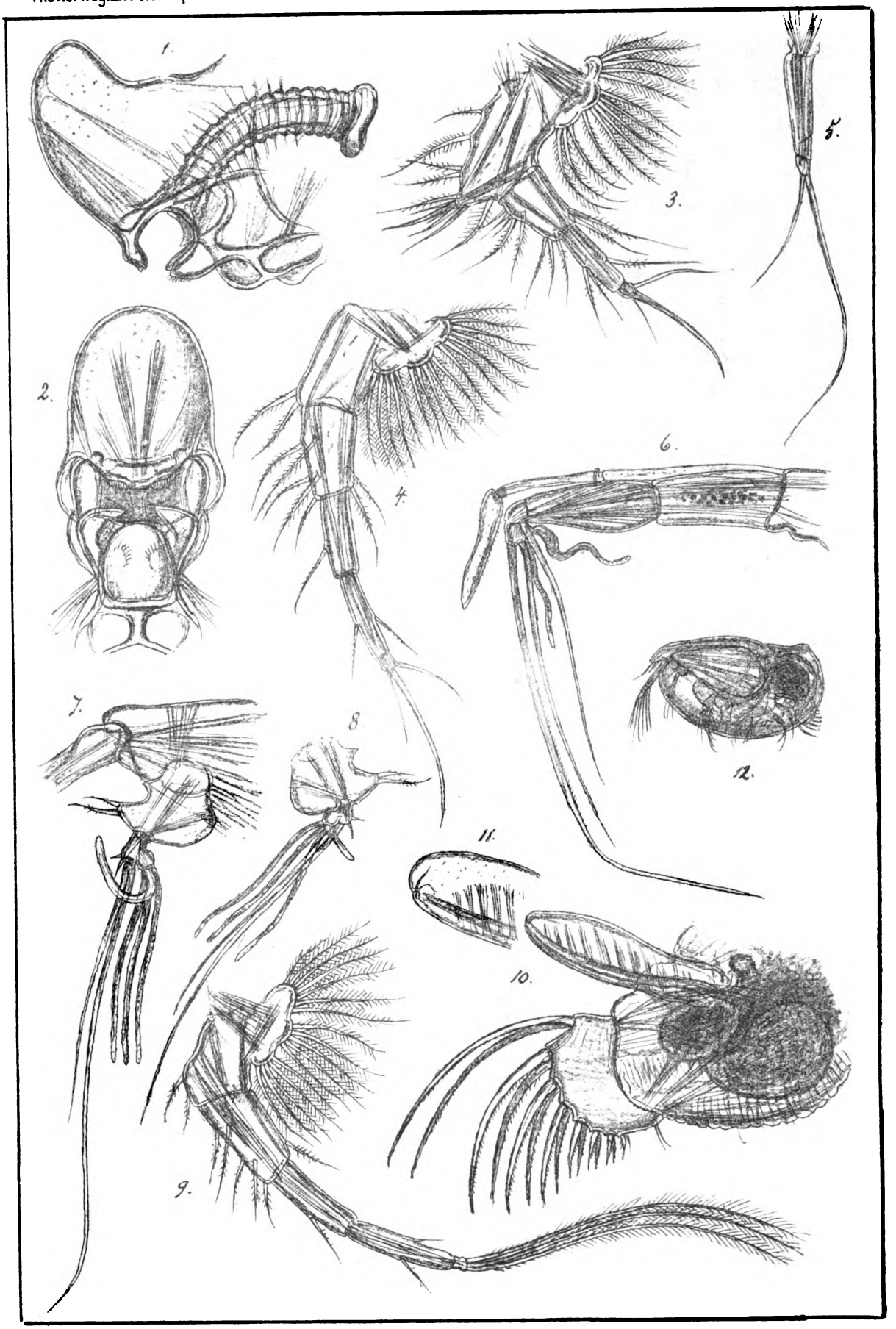
Digitized by Google

PLATE XXXVI.

Conchœcia maxima, Brady & Norman,
(continued).

Fig. 1. Anterior and posterior lips, with the adjoining parts of the chitinous skeleton and the œsophagus, viewed from left side.
— 2. Same parts, ventral view.
— 3. Leg of 1st pair, with pertaining vibratory plate.
— 4. Leg of 2nd pair.
— 5. Leg of last pair.
— 6. Antennula of male, together with the frontal tentacle, lateral view.
— 7. End of basal part of right male antenna, with the prehensile accessory ramus.
— 8. Left accessory ramus.
— 9. Leg of 2nd pair of male.
— 10. Posterior extremity of body of male, viewed from left side, showing the caudal plates and the single copulative organ.
— 11. Distal part of the copulative organ.
— 12. Very young specimen, viewed from left side.

Digitized by Google



Digitized by Google

Digitized by Google

Prof. Alex. Agassiz,
with the author's compliments

14,461

THE NORWEGIAN

NORTH POLAR EXPEDITION

1893—1896

SCIENTIFIC RESULTS

EDITED BY

FRIDTJOF NANSEN

V. CRUSTACEA

BY

G. O. SARS

PUBLISHED BY THE FRIDTJOF NANSEN FUND
FOR THE ADVANCEMENT OF SCIENCE

CHRISTIANIA
JACOB DYBWAD

LONDON,
NEW YORK, BOMBAY
LONGMANS, GREEN, AND CO.

LEIPZIG
F. A. BROCKHAUS

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

3 2044 107 167 07

Digitized by Google

Digitized by Google